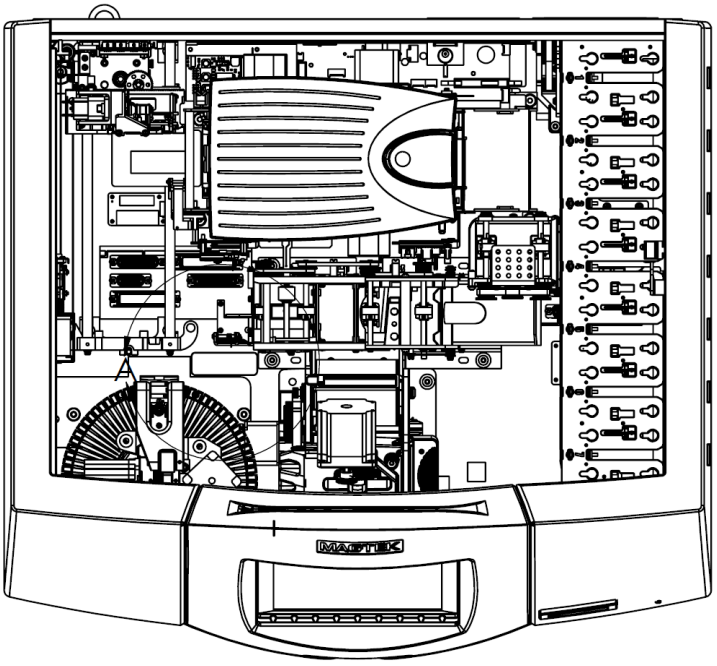
MAGTEK®
SECURITY FROM THE INSIDE

ExpressCard 2000

Instant Issuance Card Personalization System
Hardware Service Manual



June 2014

Manual Part Number:
99875607-4.01

REGISTERED TO ISO 9001:2008

MagTek I 1710 Apollo Court I Seal Beach, CA 90740 I Phone: (562) 546-6400 I Technical Support: (888) 624-8350
www.magtek.com

Copyright © 2006 - 2014 MagTek, Inc.
Printed in the United States of America

Information in this publication is subject to change without notice and may contain technical inaccuracies or graphical discrepancies. Changes or improvements made to this product will be updated in the next publication release. No part of this document may be reproduced or transmitted in any form or by any means, electronic or mechanical, for any purpose, without the express written permission of MagTek, Inc.

MagTek® is a registered trademark of MagTek, Inc.
MagnePrint® is a registered trademark of MagTek, Inc.
Magensa™ is a trademark of MagTek, Inc.
MagneSafe™ is a trademark of MagTek, Inc.
ExpressCard 2000™ is a trademark of MagTek, Inc.

Microsoft® and Windows® are registered trademarks of Microsoft Corporation.
All other system names and product names are the property of their respective owners.

Table 0.1 - Revisions

Rev Number	Date	Notes
1.01	12/11/2013	Initial release derived from 99875357-6.01, 33099078-2.01, 99875617-1.01, MagTek Support Services videos
2.01	01/14/2014	Add removal / replacement for tipper heater, hopper module, exit transport module, exit ramp and tipper module, MLB, power controller, embedded PC, power supply, MSR, touchscreen. Update some figures with improved renderings. Add orientation to cardinal directions. Incorporate warnings and re-order to support tipper cooling time. Re-order Replacement and Adjustments chapters for more logical cross-references. Improve cover removal/re-install instructions. Add time estimates for replacements. Make terminology and order of steps more consistent. Start section for troubleshooting service-only issues. Add introduction to embosser alignment. Update cleaning photos. Add sensor diagram. Improve content about security of consumables. Fix image printer replacement structure. Add details about top deck plate keys / slots.
3.01	05/05/2014	Fix minor formatting issues; add step to move hopper transport before removing side access doors; add advisory to not pinch wires when removing left side access door.
4.01	06/27/2014	Update troubleshooting information about uneven tipping; general updates to tipper heater replacement.

SAFETY

This product has been evaluated by multiple safety certification agencies, including Underwriters Laboratories (UL) and the United States Federal Communications Commission (FCC Class A and Class B), and is designed to protect both the user and the device. This document is written specifically to work in conjunction with these safety and integrity features to protect the user and the device. It is very important to follow all steps in the product documentation carefully, in the order in which they are described, and at the recommended times. Failure to do so could result in personal injury, and / or cause damage to the device, and / or void the product warranty.

The information within this manual has been prepared for use by trained professional service personnel and is not intended for general use. To maintain the safety and integrity of the machine, follow the procedures described in this manual carefully.

For your personal safety and to prevent damage to the device, disconnect power from the device before you connect or disconnect any cable, electronic board, or assembly.

SAFETY REQUIREMENTS

Caution: Never do any of the following:

- DO NOT use a ground adapter plug to connect equipment to a power socket-outlet that lacks a ground connection terminal.
- DO NOT attempt any maintenance function that is not specifically described in this manual or in other ExpressCard 2000 instructional documents published by MagTek.
- DO NOT override or "cheat" electrical or mechanical interlock devices.
- DO NOT use EC2000 supplies or cleaning materials for other than their intended purposes.
- DO NOT operate the equipment if you or anyone else have noticed unusual noises or odors.

Consider the following before operating the ExpressCard 2000:

- Connect the EC2000 to a properly grounded AC power socket-outlet. If in doubt, have the socket-outlet checked by a qualified electrician. Improper connection of the device's grounding conductor creates a risk of electric shock.
- Place the EC2000 on a solid surface that can safely support the device's weight support the weight of the EC2000 PLUS the weight of a person leaning against the device (such as a service technician).
- Be careful when moving or relocating the device. Use proper lifting techniques.
- Use materials and supplies specifically designed for MagTek devices. Using unsuitable materials may result in poor performance, and in some cases may be hazardous.

Table of Contents

Table of Contents 4
1 Required Tools, Materials, and Documents 7
1.1 Required Tools 7
1.2 Suggested Tools 7
1.3 Required Materials 7
1.4 Suggested Materials 8
1.5 Required Software and Documents 8
2 Introduction 9
2.1 Recommended Preparation for Service Appointments 9
2.2 Important Safety Information 9
2.3 How to Handle ESD-Sensitive Parts 9
2.4 Introduction to EC2000 Components 10
2.5 Device Specifications 10
2.6 About Installation & Operation 11
2.7 How to Open the Top Access Door 11
2.8 How to Safely Move Transports By Hand 11
2.9 How to Use Maintenance Functions On the Touchscreen 12
3 Preventive Maintenance 23
3.1 Prepare the Device for Preventive Maintenance 25
3.2 Clean the Card Path 25
3.3 Clean All Transport Rollers 25
3.4 Update the Software 28
3.5 Update the Firmware 29
3.6 Service the Hopper Module 33
3.7 Service the XY Transport Module 34
3.8 Service the Exit Transport Module 36
3.9 Cool the Tipper Heater / Power Down the Device 36
3.10 Clean Inside the Device 37
3.11 Service the Image Printer Module 38
3.12 Service the Embosser Module 39
3.13 Service the Electronics 42
3.14 Service the Cover 42
3.15 Perform Final Tests 42

4 Removal and Re-installation 43
4.1 How to Prepare the Device for Removing / Re-installing Modules 43
4.2 How to Remove / Re-install the Top Access Door 44
4.3 How to Remove / Re-install the Side Access Doors 48
4.4 How to Remove / Re-install the Cover 50
4.5 How to Remove / Re-install the Hopper Module 63
4.6 How to Remove / Re-install the Image Print Head 76
4.7 How to Remove / Re-install the Image Printer Module 77
4.8 How to Remove / Re-install the XY Transport Ribbon Cable 82
4.9 How to Remove / Re-install the XY Transport Module 88
4.10 How to Remove / Re-install Embosser Fonts 93
4.11 How to Remove / Re-install the Embosser Module 94
4.12 How to Remove / Re-install the Tipper Heater 101
4.13 How to Remove / Re-install the Tipper and Exit Ramp Module 106
4.14 How to Remove / Re-install the Exit Transport Module 111
4.15 How to Remove / Re-install the Embedded PC 113
4.16 How to Remove / Re-install the Embedded PC Solid State Drive (SSD) 119
4.17 How to Remove / Re-install the Main Logic Board (MLB) 122
4.18 How to Remove / Re-install the Power Controller and Backplane 125
4.19 How to Remove / Re-install the Power Supply 131
4.20 How to Remove / Re-install the Magnetic Stripe Reader (MSR) Module 136
4.21 How to Remove / Re-install the Touchscreen 138
5 Adjustments 141
5.1 How to Calibrate the Touchscreen 141
5.2 How to Calibrate the Hopper Transport Module 143
5.3 How to Calibrate the XY Transport Module 145
5.4 How to Calibrate the Embosser Module 147
5.5 How to Calibrate the Indenter Module 164
5.6 How to Calibrate the Image Printer Module 167
5.7 How to Minimize Image Printer Margins 172
5.8 How to Calibrate the Tipper Module 175
6 Diagnosis 178
6.1 Known Symptoms and Possible Causes 178
Appendix A Technical Support 179
Appendix B Glossary 179

1 - Table of Contents

Appendix C Key Loading.....180

1 Required Tools, Materials, and Documents

1.1 Required Tools

Part Number	Quantity	Description
33011008	1 ea.	ASM TOOL KIT,FIELD SERVICE,EC2000
67800019 or equiv.	1 ea.	Small USB keyboard with touchpad mouse
N/A	1 ea.	Small diagonal side cutters
N/A	1 ea.	X-Acto knife (if removing embosser characters)
N/A	1 ea.	Micrometer or digital calipers (if calibrating embosser)
N/A	1 ea.	ESD grounding wrist strap
N/A	1 ea.	ESD mat and/or ESD bags
N/A	1 ea.	USB thumb drive with required software and documentation
N/A	1 ea.	Thin-tipped permanent marker

1.2 Suggested Tools

Part Number	Quantity	Description
N/A	1 ea.	Laptop with available Ethernet port
22350302 or equiv.	1 ea.	10 ft. Ethernet cable (COM ETHERNET CAT5E BLK 10')
N/A	1 ea.	Pen or pencil
N/A	1 ea.	Paper and clipboard
N/A	1 ea.	Flashlight
N/A	1 ea.	Needle nose pliers
N/A	1 ea.	Hemostat pliers
N/A	1 ea.	Slotted screwdriver
N/A	1 ea.	Cable tie tool with adjustable tension
N/A	1 ea.	Multimeter
N/A	1 ea.	Flex Phillips screwdriver OR Electric screwdriver with flex extension

1.3 Required Materials

Part Number	Quantity	Description
97200153	1 ea.	ASM KIT,PREVENTIVE MAINTENANCE,EC2000
N/A	1 ea.	Any replacement kits specified in the work order. For a list of kits, see 33011011 REF LIST,REPLACEMENT KITS,EC2000
N/A	3 ea.	Cloth, clean and lint-free

Part Number	Quantity	Description
97200121 or equiv.	~10ml	MSP ADHESIVE,RTV SILICONE,90ML,CLEAR If removing image printer, touchscreen, embedded PC, or MSR

1.4 Suggested Materials

Part Number	Quantity	Description
33011009	1 ea.	ASM KIT,STARTER,SPARE,FIELD SERVICE,EC2000
93400047	1 ea.	PRI RIBBON, COLOR YMCKOK EV (R3314)
33070896	1 ea.	ASM RIBBON ASSY,TIP FOIL,SILVER
33070621	1 ea.	AAY ASSY,INDENT CARTRIDGE

1.5 Required Software and Documents

MagTek recommends loading the following required software and documents on the USB thumb drive or service laptop before visiting the customer site.

Part Number	Quantity	Description
99875600	1 ea.	MNL USER INSTALL & OPERATION MANUAL,EC2000
99875607	1 ea.	MNL HARDWARE SERVICE MANUAL,EC2000
99875609	1 ea.	MNL PARTS CATALOG,EC2000
99875651	1 ea.	REF PROCEDURE,PREVENTIVE MAINTENANCE,EC2000
99875646	1 ea.	REF CHECKLIST,PREVENTIVE MAINTENANCE,EC2000
N/A	1 ea.	EC2000 reference image (C:\ from a working EC2000), loaded onto USB thumb drive or service laptop
N/A	1 ea.	Set of passwords for the device being serviced
N/A	1 ea.	Factory defaults for the device being serviced
VARIOUS	0 or more	EC2000 software patch **.CAB** files provided by MagTek Support Services, loaded onto USB thumb drive or service laptop

2 Introduction

This document provides detailed information about maintaining the ExpressCard 2000 (EC2000). It is part of the ***ExpressCard 2000 Service Library***, which includes:

- ***99875600 ExpressCard 2000 User Installation and Operation Manual***
- ***99875607 ExpressCard 2000 Hardware Service Manual***
- ***99875609 ExpressCard 2000 Parts Catalog***

Documents in the service library reference each other frequently and are designed to be used together.

2.1 Recommended Preparation for Service Appointments

Before visiting a customer for a service appointment, MagTek recommends you do the following:

1) Review the documentation. For example:
   a) ***99875600 ExpressCard 2000 User Installation and Operation Manual*** contains important information about the device, including **Introduction to EC2000 Features**, **Introduction to EC2000 Components**, **Operation**, **Maintenance**, and **Troubleshooting**.
   b) Section **2 Introduction**, especially section **2.2 Important Safety Information** and section **2.3 How to Handle ESD-Sensitive Parts**.
   c) All sections relevant to the service you will be performing. Depending on the service order, it may include section **3 Preventive Maintenance**, section **6 Diagnosis**, section **5 Adjustments**, and section **4 Removal and Re-installation**.
2) Gather and test/inspect all tools, materials, and documents, using section **1 Required Tools, Materials, and Documents** as a guide. If you are performing replacements, also gather and inspect available replacement parts.
3) Copy software and documents you will need to a USB thumb drive.
4) Print any supporting documents you want to have available in hardcopy form.
5) Print a copy of ***99875646 REF EC2000 PREVENTIVE MAINTENANCE CHECKLIST***.
6) Test the field service laptop to make sure its browser and network connection are functional.

2.2 Important Safety Information

The information in this document is intended for use by trained professional service personnel only. It is not intended for general use. To maintain the safety and integrity of the device, it is important to follow the procedures laid out in this manual.

⚠CAUTION: For your personal safety, and to prevent damage to the device, disconnect power from the ExpressCard 2000 before you connect or disconnect any cable, electronic board, or assembly.

2.3 How to Handle ESD-Sensitive Parts

To prevent electrostatic discharge (ESD) damage to electronic parts, follow the instructions below:

- Keep ESD-sensitive parts in their original shipping containers until you are ready to install them.
- When handling ESD sensitive parts, prevent static discharge by moving around as little as possible. Static charges are produced by rubbing together clothing, carpets, furniture, etc.
- Wear an ESD wrist strap connected to a metal part on the device's chassis, such as the base plate. This will discharge static electricity from your body.
- Hold ESD-sensitive parts by their edges or their mounting trays. Do not touch their pins or circuitry.

- Do not place an ESD-sensitive part on the device or on a metal table; put it in an ESD bag or on an ESD mat.
- Use extra caution when working under climate conditions that increase the potential for ESD, such as cold weather or low humidity.

2.4 Introduction to EC2000 Components

For an introduction to identifying the components of the EC2000, see ***99875600 EC2000 User Installation and Operation Manual***.

This manual uses the words "Front," "Rear," "Left," and "Right" to describe where to find various parts of the device. These terms assume the reader is standing in front of the device facing the touchscreen, and are shown in **Figure 2-1**. During service, it is normal to move around the device to get easier access to parts. In the same way, many of the photos and drawings in this manual show the device from different angles that make key "landmarks" visible. In these cases, the caption will generally state the direction the figure can be seen from (for example, "FRONT RIGHT VIEW").

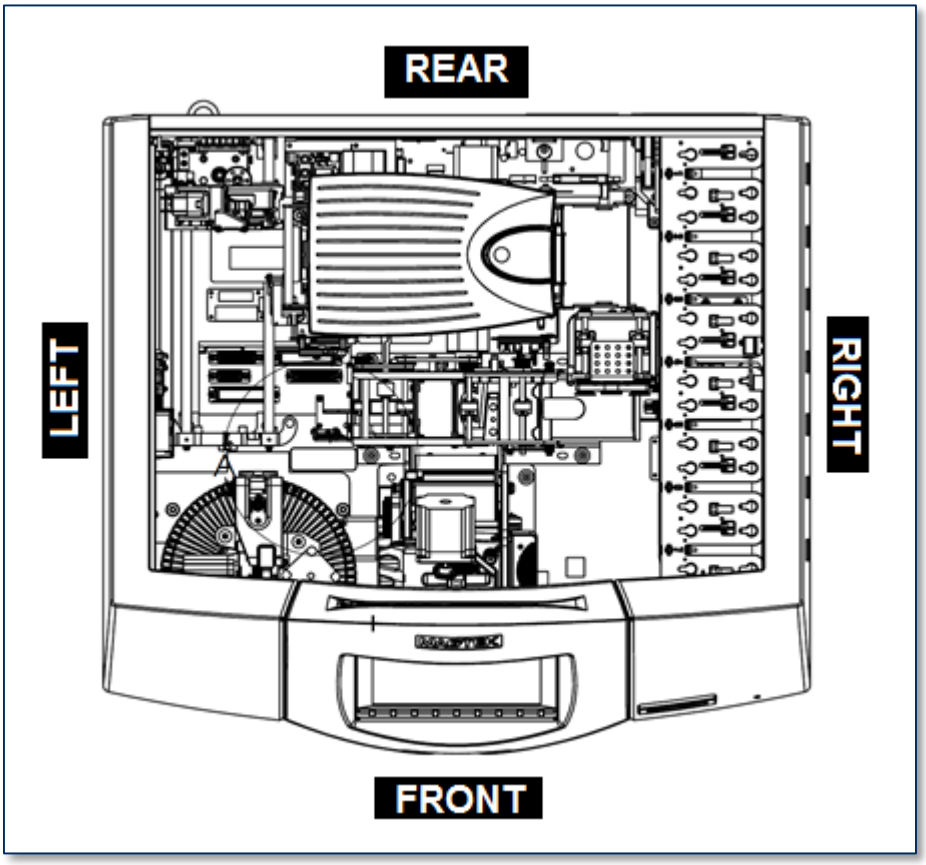


Figure 2-1 – Front/Rear/Left/Right Definition (TOP VIEW)

2.5 Device Specifications

For Electrical, Acoustical, Environmental, Communication, Physical, Encoding, and other detailed specifications of the EC2000, see ***99875600 EC2000 User Installation and Operation Manual***.

2.6 About Installation & Operation

For detailed instructions about planning, installation, operation, and basic maintenance, see ***99875600 EC2000 User Installation and Operation Manual***.

2.7 How to Open the Top Access Door

For instructions to open the top access door, see ***99875600 EC2000 User Installation and Operation Manual***.

Some procedures require removing the top access door completely. For removal instructions, see section **4.2 How to Remove / Re-install the Top Access Door**.

2.8 How to Safely Move Transports By Hand

Although the **MCP Commands** page is the safest way to move parts within the EC2000 (see section **2.9.1 How to Use the MCP Commands Page**), occasionally it is necessary to move parts by hand. To prevent injury or damage to the device, follow these guidelines:

- If you need to move the hopper transport or XY transport by hand, **pull only on their serrated drive belts** as shown in **Figure 2-2**. This reduces the risk of damaging the transport.
- If you need to move the XY transport along its tracks, gently **pull the carriage to the left side** of the device before moving so it won't catch on the image printer.

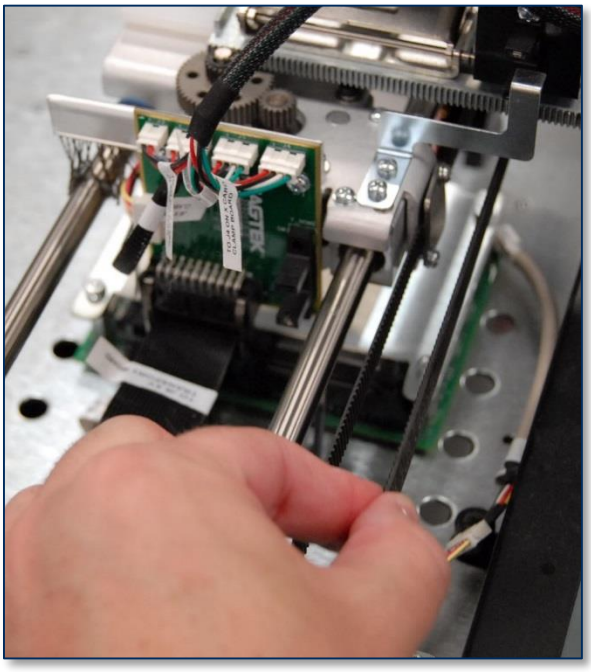


Figure 2-2 - Move Transports By Pulling Drive Belts

- You can rotate the rollers on all transports by hand to push/pull cards to where they can be removed.
- If a card is stuck in the hopper transport but has not yet gone into the image printer, one easy way to remove the card is to remove one or two hoppers next to the hopper transport, then pull on its triangular belt to move the card toward the hopper deck.
- If a hopper transport has moved a card mostly into the image printer but the card has become stuck, remove the card forward through the image printer (toward the XY transport). Do not try to reverse cards from the image printer into the hopper transport.

2.9 How to Use Maintenance Functions On the Touchscreen

This section explains how to use the maintenance functions on the EC2000's touchscreen. Most of the functions let you isolate the various subsystems during troubleshooting to determine the failure point, and to verify repairs have corrected the problem.

To visually inspect the device while it is running, open the top access door and block the sensor mounted to the rear left of the top access door track. For convenience, **33011008 ASM TOOL KIT,FIELD SERVICE,EC2000** provides heat shrink tubing that fits snugly over the top access door sensor. Be sure to put it back in your toolkit before closing the top access door.

To access most maintenance functions of the device using the touchscreen, do the following:

1) Press the **Menu** button to open the **Main Menu** page.
2) Press the **Settings** button to open the **Settings Menu** page. The **Settings Menu** page provides access to user and service functions of the device, some of which require a password. If customers have changed the passwords, request the new passwords from them. Otherwise the passwords will be the factory defaults provided in the sections below.
3) Additional maintenance functions can be accessed from the **Settings Menu** page by pressing the **Service** button to open the **Service Menu** page. For example, you can use the Sensor Utility page to view the status of the EC2000's sensors, or use the **MCP Commands** page to move the various parts of the EC2000 individually rather than as part of a standard sequence.

2.9.1 How to Use the MCP Commands Page

The move the various parts of the EC2000 individually rather than as part of a standard sequence, use the touchscreen to navigate to **Menu** > **Settings** > **Service** > **MCP Commands** to open the **MCP Commands** page. **Note that the MCP Commands page may allow you to make moves that could damage the device -- think carefully before sending a direct move command!**

Table 2.1 provides an **MCP Commands** sequence that tests most subsystems by moving a card from hopper 1 to the output bin. You can test by pressing each button in the list and verifying the described action happens correctly. The gray highlighted lines make up a shorter sequence that does the same thing.

Table 2.1 - Controller Buttons and Corresponding Movements

Press This Button	Verify This Happens
Pusher Home	Hopper transport's pusher moves into safe position for move
8 To Hopper	Hopper transport moves to (or stays at) manual feed slot, slot light flashes
7 To Hopper	Hopper transport moves to (or stays at) hopper 1, slot light stops flashing
6 To Hopper	Hopper transport moves to (or stays at) hopper 1
5 To Hopper	Hopper transport moves to (or stays at) hopper 1
To Manual Feed	Hopper transport moves to (or stays at) manual feed slot, slot light flashes
4 To Hopper	Hopper transport moves to (or stays at) hopper 1
3 To Hopper	Hopper transport moves to (or stays at) hopper 1
Shuttle Home	Hopper transport moves near hopper 1

Press This Button	Verify This Happens
2 To Hopper	Hopper transport moves to (or stays at) hopper 1
1 To Hopper	Hopper transport moves to (or stays at) hopper 1
Bot Cartridge Unload, **Indenter Move**	Rear (black) indent cartridge moves out of embosser toward rear of device
Bot Cartridge Load, **Indenter Move**	Rear (black) indent cartridge moves back into embosser
Bot Cartridge Home, **Indenter Move**	Rear (black) indent cartridge moves back into (or stays in) embosser
Bot Cart to Indent Loc., **Indenter Move**	Rear (black) indent cartridge moves between letters on embosser wheel
Bot Ribbon Advance, **Indenter Move**	Ribbon in rear (black) indent cartridge advances by about ¼”
Top Cartridge Unload, **Indenter Move**	Only if testing EC2000 with Front Indenter installed: Front (white) indent cartridge moves out of embosser toward rear of device
Top Cartridge Load, **Indenter Move**	Only if testing EC2000 with Front Indenter installed: Front (white) indent cartridge moves back into embosser
Top Cartridge Home, **Indenter Move**	Only if testing EC2000 with Front Indenter installed: Front (white) indent cartridge moves back into (or stays in) embosser
Top Cart to Indent Loc., **Indenter Move**	Only if testing EC2000 with Front Indenter installed: Front (white) indent cartridge moves between letters on embosser wheel
Top Ribbon Advance, **Indenter Move**	Only if testing EC2000 with Front Indenter installed: Ribbon in front (white) indent cartridge advances by about ¼”
Roller Consume	Hopper transport’s wheels turn for a few seconds
Push To Roller	Hopper transport takes a card from current hopper
Shuttle To Printer	Hopper transport moves to image printer
Roll To Printer	Hopper transport’s wheels turn for a few seconds to feed card into image printer. Press **Printer Eject** button to move card through image printer.
XY Home	XY Transport moves to rear left of device
XY Home X	XY Transport’s X carriage moves to the left
XY Home Y	XY Transport’s Y transport moves to the rear of the device
XY To Printer	XY Transport moves to image printer
XY To Printer In	XY Transport’s X carriage moves toward image printer to engage with card
Unclamp Card	X carriage’s card clamp rotates to unclamped position
Printer Eject	Card at image printer input is ejected to image printer exit

Press This Button	Verify This Happens
Clamp Card	X carriage clamps card at printer exit
Embosser Home	Embosser wheel moves to first character on wheel (look for empty tines next to the tine that is currently between the hammers) Embosser hammers open completely (not squeezing embosser tines)
Wheel Home	Embosser wheel moves to first character on wheel (look for empty tines next to the tine that is currently between the hammers)
XY To Embosser	XY Transport moves card out of printer and to embosser
CardHomeXY	XY Transport moves card so its lower left corner is between embosser tines
XY To Exit	XY Transport moves card to Exit Transport's input rollers
Unclamp Card	X carriage's clamp releases the card
Exit Reject	Exit transport raises its bottom roller, rolls for a short period of time. Ramp fan turns on. Card goes into Card Rejection Bin.
Exit Eject	Exit Transport rolls card to exit ramp, ramp fan turns on briefly.

2.9.2 How to Use the Sensor Utility Page

To check the real-time status of all EC2000 sensors, use the touchscreen to navigate to **Menu** > **Settings** > **Sensors** to open the **Sensor Utility** page. In normal operation with the top access door closed, with all card stock hoppers inserted, and with the device just powered up and ready to process cards, the **Sensor Utility** page should match **Figure 2-3**.

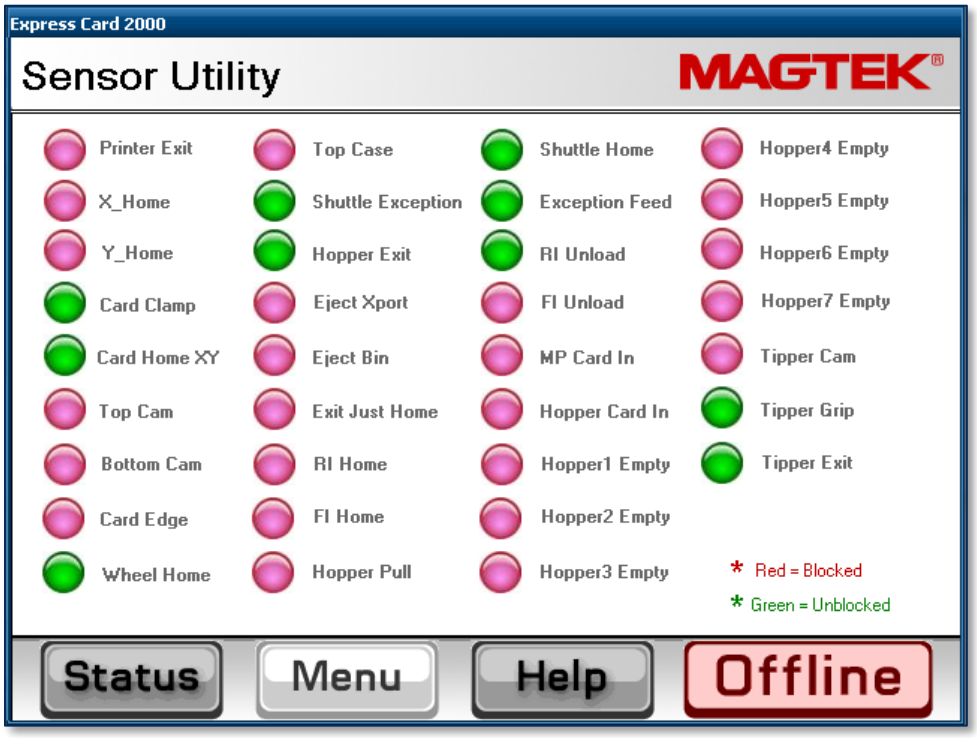


Figure 2-3 - Sensor Utility Page

To test a sensor, block or unblock it and verify its status changes. **Table 2.2** provides descriptions of each sensor and the cases where it is blocked or unblocked, and **Figure 2-4** on page 17 shows where all sensors are located in the device.

Table 2.2 - EC2000 Sensor Functions

Sensor Name	Function
Printer Exit	Blocked when there is NO card in the image printer exit, and is unblocked when there is a card in the image printer exit.
X_Home	Blocked when the X carriage on the XY transport is parked at its left edge.
Y_Home	Blocked when the XY transport is parked at the rear of the device.
Card Clamp	Blocked when the card clamp on the XY transport is closed.
Card Home XY	Blocked when the XY transport reaches the front of the device (at the embosser), regardless of its X position.
Top Cam	Blocked during normal operation and briefly unblocks when the cam that drives the top embosser hammer reaches specific points in its rotation.
Bottom Cam	Blocked during normal operation and briefly unblocks when the cam that drives the bottom embosser hammer reaches specific points in its rotation.

Sensor Name	Function
Card Edge	Blocked EITHER when the embosser daisy wheel is turned such that one of the tines blocks the sensor, OR when a card enters the area between the embosser wheels.
Wheel Home	Blocked when the small fin on top of the embosser daisy wheel points toward the front of the device.
Top Case	Blocked when the top access door is closed.
Shuttle Exception	Blocked when the hopper transport pushes far enough toward the front of the device that it mechanically rotates to orient with the manual feed slot.
Hopper Exit	Blocked when a card reaches the point where it is fully and safely loaded from a hopper into the hopper transport.
Eject Xport	Reserved for future use.
Eject Bin	Reserved for future use.
Exit Just Home	Reserved for future use.
RI Home	Blocked when the rear indent cartridge is in the loaded position (toward the front of the device).
FI Home	Only used on devices that have the optional front indent module installed. Blocked when the front indent cartridge is in the loaded position (toward the front of the device).
Hopper Pull	Unblocked when the card puller on the hopper transport moves in to pick up a card.
Shuttle Home	Blocked when the hopper transport is parked at the rear right corner of the device.
Exception Feed	Blocked when a card just enters the manual feed slot.
RI Unload	Blocked when the rear indent cartridge is in the unload position (toward the rear of the device).
FI Unload	Only used on devices that have the optional front indent module installed. Blocked when the front indent cartridge is in the unload position (toward the rear of the device).
MP Card In	Reserved for future use.
Hopper Card In	Reserved for future use.
Hopper1 Empty - Hopper7 Empty	Unblocked when there is no hopper installed in the specified hopper slot.
Tipper Cam	Blocked when the tipper heating element is in the up/idle position.
Tipper Grip	Blocked when a card just reaches the rollers on the exit ramp.
Tipper Exit	Blocked when a card just reaches the end of the exit ramp.

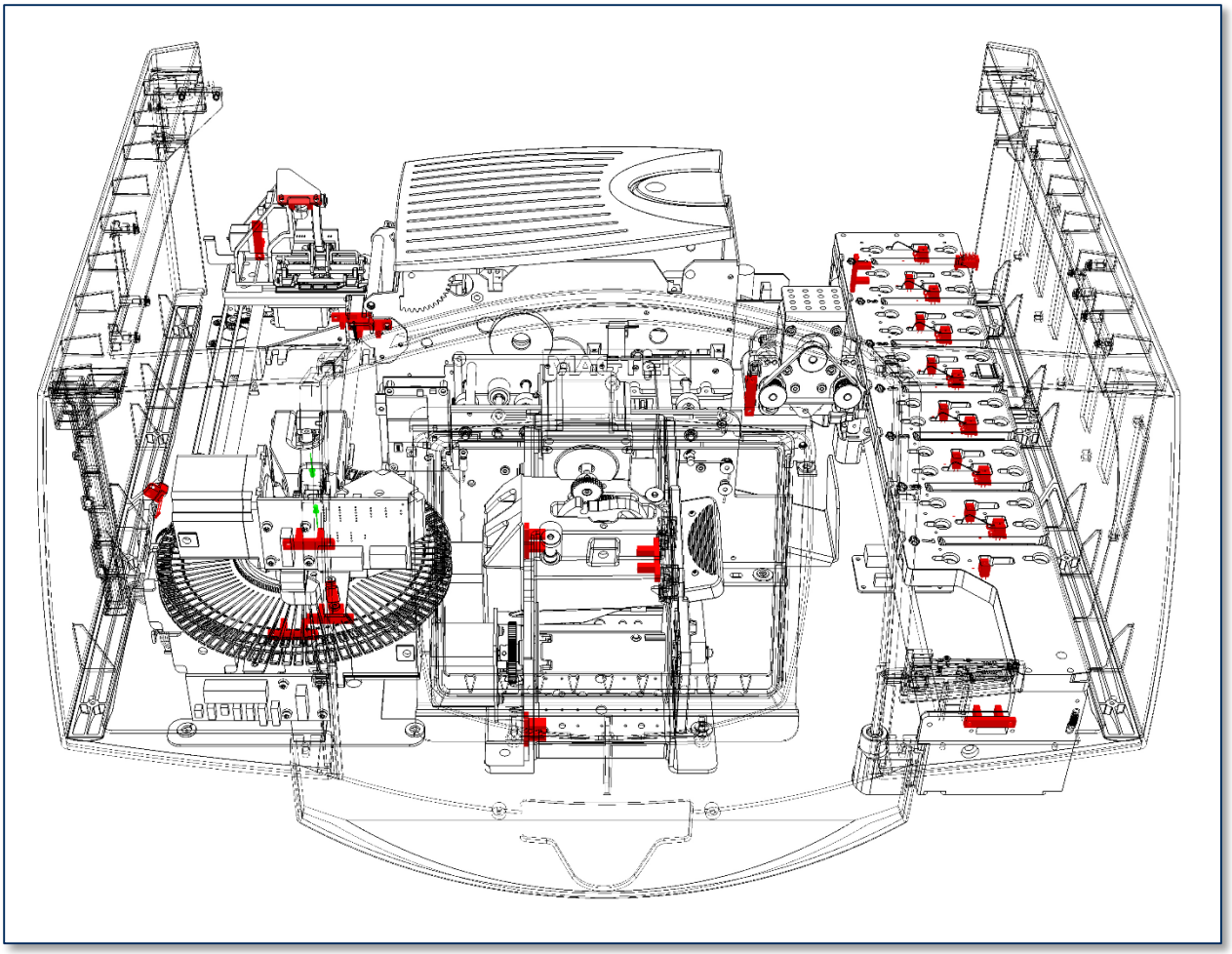


Figure 2-4 - All EC2000 Sensors Shown In Red (FRONT VIEW)

2.9.3 How to Use the Embosser Utility Page

2.9.3.1 About the Embosser Utility Page

To manually move the embosser daisy wheel or hammer cam motors, or to adjust the depth of individual embossed characters, use the touchscreen to navigate to **Menu** > **Settings** > **Service** > **Embosser**, then enter service passwords **4567890** and **0987654** to open the **Embosser Utility** page.

Figure 2-5 - Embosser Utility Page

The "Steps/Direction" box specifies how many steps the motor will take when you press any of the **Move** buttons in the top row. Adjust the "Steps/Direction" value by typing a new value on the keyboard, or by pressing the up and down arrows. Change how quickly the arrow buttons change the value by selecting the **1 per**, **10 per**, or **100 per** radio buttons; the default is 100 steps.

The following sections specify how to use the **Embosser Utility** page to perform specific operations.

2.9.3.2 How to Move the Embosser Daisy Wheel

The daisy wheel, driven by the **Wheel Motor Move** button, contains the set of characters the embosser can press into cards. Each character is mounted to one of 80 **tines** numbered 1 through 80. The motor takes 20 steps to advance from one tine to the next. To move the daisy wheel a full 360 degrees, move it (80 characters) x (20 steps per character) = 1600 steps.

To move the daisy wheel, follow these steps from the **Embosser Utility** page:

1) Turn on the **Move At Fast** checkbox. The daisy wheel is designed and tested to operate at fast speed.
2) Set the number of steps you want the daisy wheel to take (see section **2.9.3.1 About the Embosser Utility Page**) and press the **Wheel Motor Move** button.
3) Repeat the moves as necessary to complete the test.

4) Re-home the daisy wheel by pressing either the **Counter Clockwise Home** or **Clockwise Home** button. In normal operation, the daisy wheel homes counter-clockwise.
5) Press the **All Motors Stop** button to make sure the daisy wheel motor is not energized / holding still.
6) Press the **Status** button to return to the **Status** page.

2.9.3.3 How to Move the Embosser Cams (Hammers)

The top and bottom embosser cams, which can be driven by the **Top Clamp Motor Move** button and **Bottom Clamp Motor Move** buttons, squeeze the embosser hammers to imprint raised characters on cards. In a typical emboss cycle, each of the cam motors takes about 600 steps forward to move the cam from its home position to press into the card, and 600 in reverse to retract back to the home position. One step is approximately equal to 0.225 degrees of rotation, so the total emboss cycle covers about 135 degrees.

To move the top embosser cam, bottom embosser cam, or both cams, follow these steps from the **Embosser Utility** page:

1) Press the **All Motors Stop** button to make sure no motor is applying force.
2) If there is nothing in the way of the hammers, press the **Top & Bottom Home** button to make sure the cams are not closed. The "home" position is the standard starting position for an emboss cycle.
3) Press either the **Counter Clockwise Home** button or the **Clockwise Home** button to make sure the daisy wheel has a character positioned between the embosser hammers. If the daisy wheel is off-center, the hammers could damage it.
4) You may encounter a situation during testing where you want to close the hammers to their calibrated close position, but prevent one embosser hammer from moving during testing; for example, to prevent damage if something is jammed in the device, or if moving a specific cam would be a safety hazard. In that type of situation, you can prevent one or both of the cams from moving in the next step by checking the **Do Not Move Top** and / or **Do Not Move Bottom** checkbox. **Note: This feature only locks out movement when pressing the Close Clamp button and will not prevent clamp movement for any other buttons on the page or during normal device operation.**
7) Set the number of steps you want the cam(s) to move (see section **2.9.3.1 About the Embosser Utility Page**) and press the **Top Clamp Motor Move** or **Bottom Clamp Move** button, OR press the **Close Clamp** button, OR press the **All Motors Stop** button if you find you have moved too far and need to release the cams immediately.
8) Repeat the moves as necessary to complete the test.
9) Press the **Top & Bottom Home** button to make sure the cams are not left closed.
10) Press the **All Motors Stop** button to make sure no motor is applying force.
11) Press the **Status** button to return to the **Status** page.

2.9.3.4 How to Change the Embosser Character Depth and Dwell Time

Over time or after embosser service, an individual embossed character's height may change to the point that it doesn't match other characters. The **Emboss Settings** page provides access to settings for each tine on the embosser daisy wheel, which affect the pressing force and hold time for that one character.

The **Emboss Settings** page provides two ways to change these settings: You can import settings for all tines from a file on the EC2000's solid state drive or a USB thumb drive using the **Read** button, or you can change each tine's settings individually. The page also provides a **Reset** button that will reset all tine settings to factory defaults.

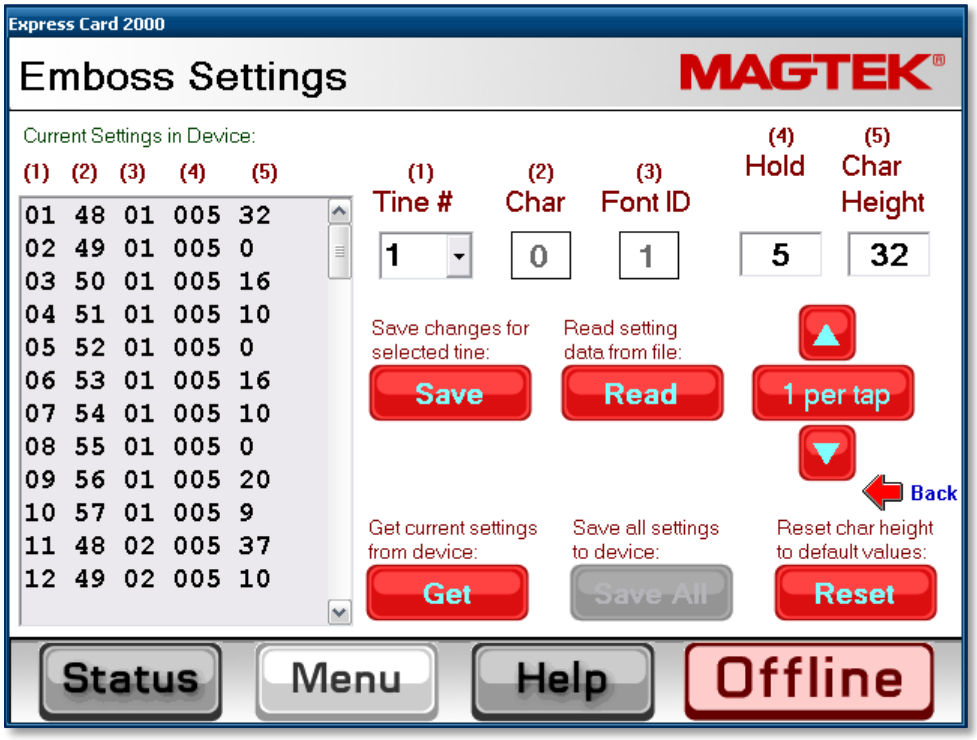


Figure 2-6 - Emboss Settings Page

To adjust a single character's pressing force or hold time, do the following:

1) Open the **Emboss Settings** page: Navigate to **Menu** > **Settings** > **Service** > **Embosser** and enter service passwords **4567890** and **0987654** to open the **Embosser Utility** page, then press the **Settings** button below **Set Emboss Hold Time & Height**.
2) Press the **Get** button to refresh the settings shown in the **Current Settings in Device** list box.
3) Select the tine you want to change in the **Tine #** drop-down menu. The touchscreen will display the current settings for that tine in the top row of the page.
4) To adjust how long the embosser hammer will press that specific character into the card before lifting back off to the embosser home position, change the **Hold** setting. The setting is in increments of 10 milliseconds, so a value of 5 equals a hold time of 50 ms. In most cases, setting **Hold** to 0 should produce acceptable results:
   a) Select the **Hold** field.
   b) Enter a new value using the keyboard, or use the up and down arrows to adjust the value. You can set how quickly the arrows will change the value by pressing the **N per tap** button.
5) To adjust the depth the hammer will press that specific character into cards, change the **Char Height** setting. The EC2000 will add this value to the device's global **EmbossAngleTop** and **EmbossAngleBottom** settings, or **IndentAngleTop** and **IndentAngleBottom** settings, as appropriate (see section **5.4 How to Calibrate the Embosser**). To increase the embossed depth of that specific character, increase the value; to decrease the embossed depth of a given character, decrease the value. The valid range is from -127 to +127, but typical values are in the -20 to +40 range.
6) Press the **Save All** button to save the settings for all tines
7) Press the **Status** button to return to the **Status** page.

2.9.4 How to Use the Character Mapping Page

The **Character Mapping** page provides support for changing the configuration of characters on the EC2000 embosser's daisy wheel, and will most commonly be used in conjunction with the steps in section **4.10 How to Remove / Re-install** Embosser Fonts and in section **4.11 How to Remove / Re-install the Embosser**. Functions include adding new fonts, moving an existing character to a different tine, and removing a character from a tine.

At any time (such as if you make a mistake that you discover later in testing), you can reset the changes you made to the daisy wheel and return them to factory defaults by navigating to **Menu** > **Settings** > **Service** > **Wheel Map** and pressing the **Reset** button.

To **move a character** from one daisy wheel tine to another, follow these steps:

1) Look at the numbers stamped on each daisy wheel tine to determine which tine the character was (or is) originally on, and which tine you will move it to.
2) If the character is still on the old tine, uninstall it. Every character has a piece on the top daisy wheel and a second piece on the bottom daisy wheel, so make sure to uninstall both, and to note which piece belongs on the top and which piece belongs on the bottom.
3) Install both halves of the character on the new tine.
4) From the touchscreen, navigate to **Menu** > **Settings** > **Service** > **Char Map** to open the first **Character Mapping** password page.
5) Enter password **4567890**, then press the **E** key to open the second **Character Mapping** password page.
6) Enter password **0987654**, then press the **E** key to open the **Character Mapping** page.
7) Use the **From Current** dropdown list to select the old tine where the character was installed.
8) Use the **To New Tine** dropdown list to select the new tine where the character is now installed.
9) Press the **Move** button.
10) Repeat the above steps for any additional characters you need to move.
11) Test your changes by creating a sample card or an embosser tuning card.

To **remove a character** from a daisy wheel tine, follow these steps:

1) Look at the numbers stamped on each daisy wheel tine to determine which tine you want to remove the character from.
2) If the character is still on the old tine, uninstall it. Every character has a piece on the top daisy wheel and a second piece on the bottom daisy wheel, so make sure to uninstall both.
3) From the touchscreen, navigate to **Menu** > **Settings** > **Service** > **Char Map** to open the first **Character Mapping** password page.
4) Enter password **4567890**, then press the **E** key to open the second **Character Mapping** password page.
5) Enter password **0987654**, then press the **E** key to open the **Character Mapping** page.
6) Use the **From Current Tine** dropdown list to select the tine where the character was installed.
7) Press the **Clear** button.
8) Repeat the above steps for any additional characters you need to remove.
9) Test your changes by creating a sample card or an embosser tuning card.

To **add a new character** to a daisy wheel tine, follow these steps:

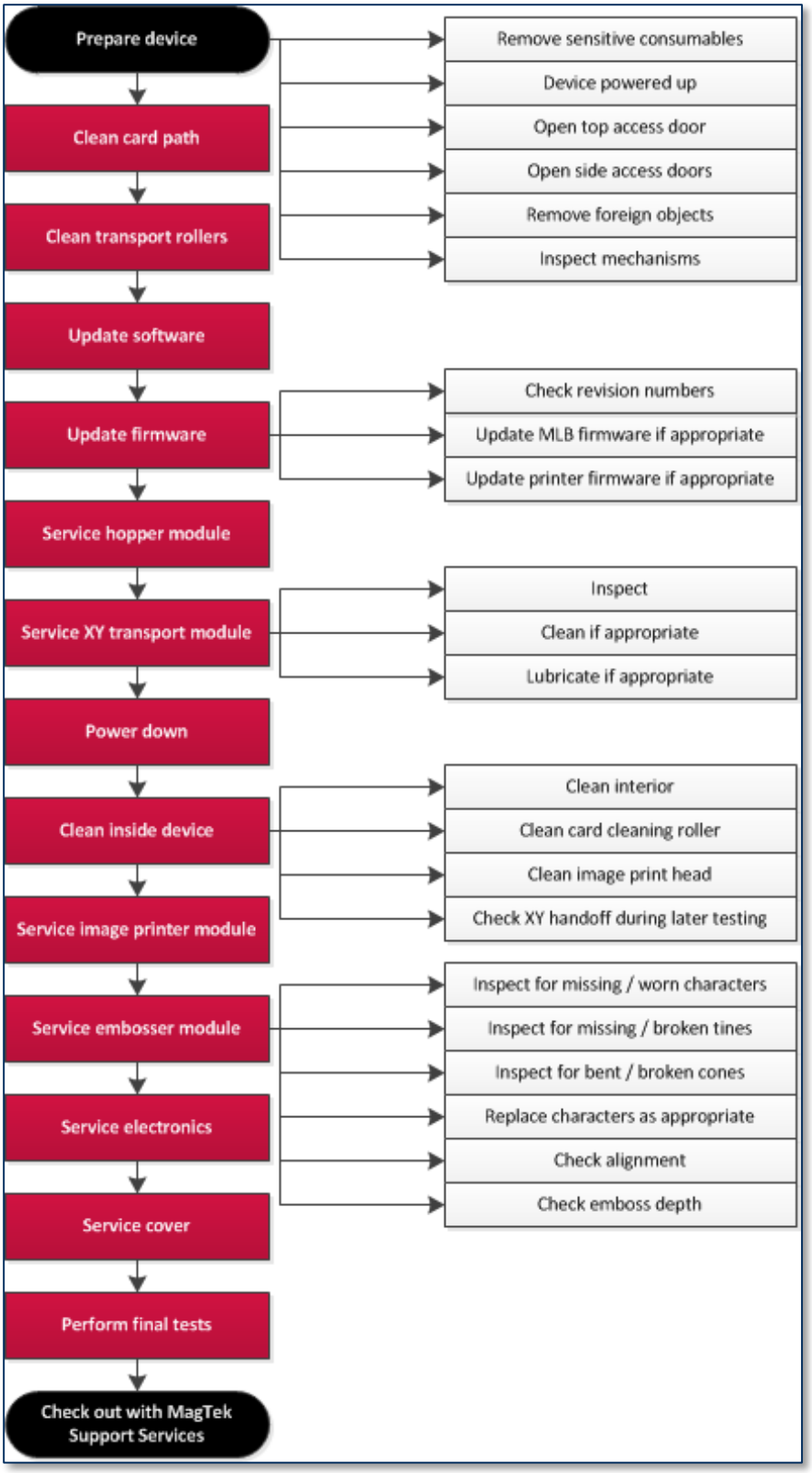
1) Verify the EC2000 software supports the character(s) you are going to install.
2) Look at the numbers stamped on each daisy wheel tine to find the number of the tine where you will install the new character.
3) Install the character on the tine. Every character has a piece on the top daisy wheel and a second piece on the bottom daisy wheel, so make sure to install both, and to put each piece on the correct half: For embossing fonts and rear indent fonts (FontID1, FontID2, and FontID4), the "punch" (positive) side goes on the bottom; for front indent fonts (FontID3), the "punch" side goes on the top. Indent fonts have a "blank" flat side that goes opposite the punch side.
4) Install both halves of the character on the new tine.
5) From the touchscreen, navigate to **Menu** > **Settings** > **Service** > **Char Map** to open the first **Character Mapping** password page.
6) Enter password **4567890**, then press the **E** key to open the second **Character Mapping** password page.
7) Enter password **0987654**, then press the **E** key to open the **Character Mapping** page.
8) Use the **Add Char.** dropdown list to select what character you are installing (for example, if you are installing a capital 'A,' select 65). Verify you have selected the character you expected to select by looking at the **ASCII Char** box next to the dropdown list.
9) Use the **Font** dropdown list to indicate the type of font you have installed (FontID1-4).
10) Use the **To** dropdown list to select which tine you have installed the characters on.
11) Press the **Add** button.
12) Repeat the above steps for any additional characters you need to add.
13) Test your changes by creating a sample card or an embosser tuning card.

3 Preventive Maintenance

The EC2000 requires regular preventive maintenance to maintain image quality and reliability. Follow the steps in each section below to perform preventive maintenance.

Before starting, ask the EC2000 user or customer if they have had any specific problems with the device. If you need to troubleshoot a specific problem, address that before performing preventive maintenance. See section **6 Diagnosis** for assistance troubleshooting reported issues.

The following page shows a flowchart that gives a brief overview of the preventive maintenance procedure. It should only be used as a guide, not as a substitute for following the detailed steps provided.


Prepare device
Remove sensitive consumables
Device powered up
Clean card path
Open top access door
Open side access doors
Clean transport rollers
Remove foreign objects
Inspect mechanisms
Update software
Check revision numbers
Update firmware
Update MLB firmware if appropriate
Update printer firmware if appropriate
Service hopper module
Inspect
Service XY transport module
Clean if appropriate
Lubricate if appropriate
Power down
Clean interior
Clean inside device
Clean card cleaning roller
Clean image print head
Service image printer module
Check XY handoff during later testing
Inspect for missing / worn characters
Service embosser module
Inspect for missing / broken tines
Inspect for bent / broken cones
Service electronics
Replace characters as appropriate
Check alignment
Service cover
Check emboss depth
Perform final tests
Check out with MagTek Support Services

3.1 Prepare the Device for Preventive Maintenance

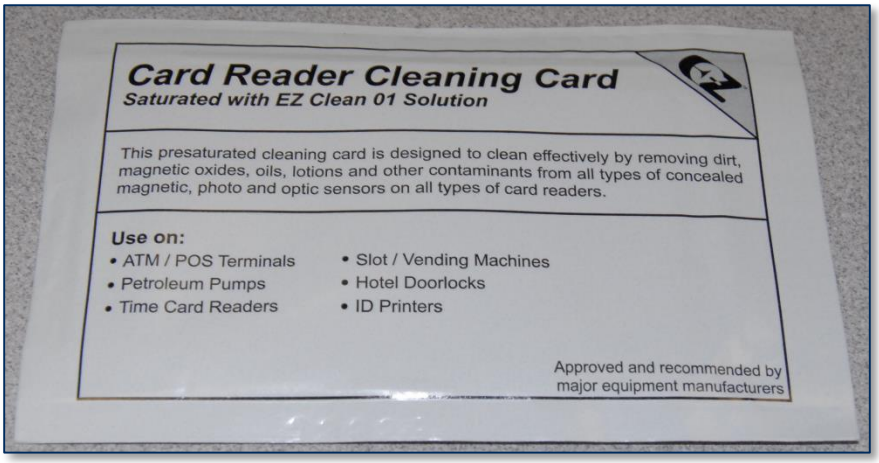
To prepare the device for service, follow these steps:

1) Offer the customer the opportunity to remove any proprietary or security-sensitive consumables from the device, including card stock, image printer ribbons, indent cartridges, and tipper foils. Some consumables contain negative imprints of cardholder data and must be handled securely.
2) Make sure the device is powered up and connected to the network.
3) Open the top access door (see ***99875600 EC2000 User Installation and Operation Manual***).
4) Open the two side access doors (see section **4.3 How to Remove / Re-install the Side Access Doors**).
5) Inspect the device for any items that do not belong inside the cover, and remove them (examples include loose mechanical parts, cards, insect or animal leavings, or jewelry).
6) Inspect the mechanical parts inside the device and inside the image printer, paying special attention to belts, cables, and plastic gears to see if there are signs of wear or damage.

3.2 Clean the Card Path

Clean the card path per the steps in the **Maintenance** section of ***99875600 EC2000 User Installation and Operation Manual***.

3.3 Clean All Transport Rollers


Card Reader Cleaning Card
Saturated with EZ Clean 01 Solution
This presaturated cleaning card is designed to clean effectively by removing dirt, magnetic oxides, oils, lotions and other contaminants from all types of concealed magnetic, photo and optic sensors on all types of card readers.
Use on:
• ATM / POS Terminals
• Petroleum Pumps
• Time Card Readers
• Slot / Vending Machines
• Hotel Doorlocks
• ID Printers
Approved and recommended by major equipment manufacturers

Follow these steps to clean the rollers on the hopper transport, XY transport, and exit transport. Use the **white** cleaning cards:

1) Remove hoppers 1 and 2.
2) Remove the tipper foil cartridge (see ***99875600 ExpressCard 2000 User Installation and Operation Manual*** for detailed instructions) and set it aside in a secure location, or offer it to the customer for temporary storage or secure disposal.
3) On the touchscreen, navigate to **Menu** > **Settings** > **Service** > **MCP Cmds** to open the **Controller Commands** page.
4) Use the **white** cleaning card and **do not let the rollers take it out of your hand** as you clean each set of rollers as follows:
   a) Feed the card partly into the hopper transport and press the **Roller Consume** button. Hold the card there until the rollers stop moving.

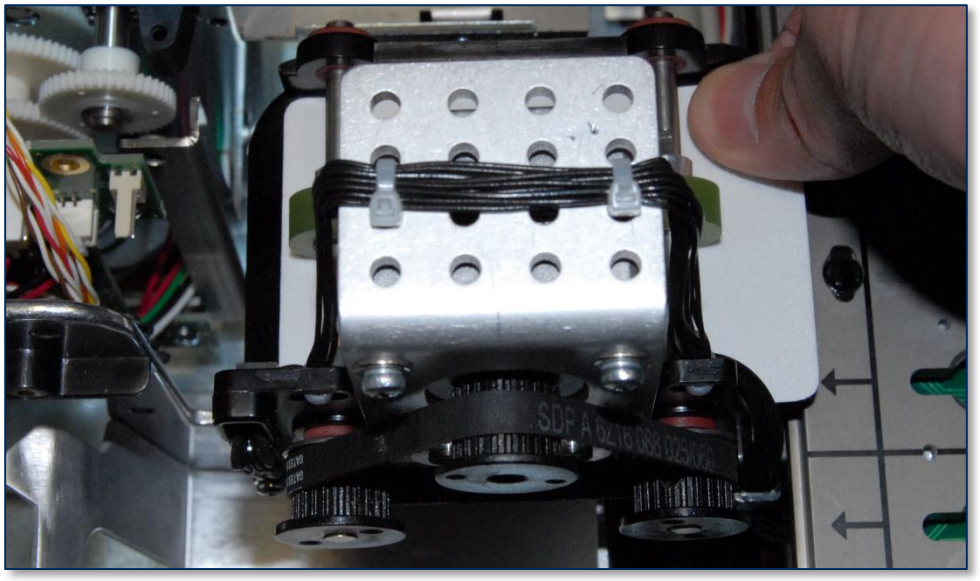


Figure 3-1 - Cleaning the Hopper Transport Rollers (TOP VIEW FROM FRONT)

b) Feed the card partly into the **left** side of the exit transport and press the **Exit Eject** button. Hold the card there until the rollers stop moving.

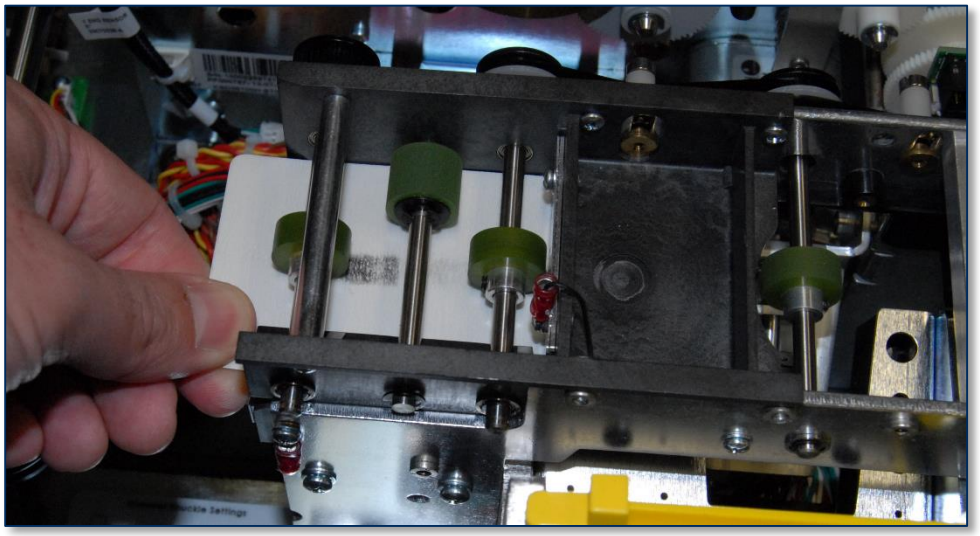


Figure 3-2 - Cleaning the Left Side of the Exit Transport (TOP VIEW FROM FRONT)

c) Feed the card partly into the **right** side of the exit transport and press the **Exit Reject** button. Push inward to keep the card from being pushed out until the rollers stop moving.

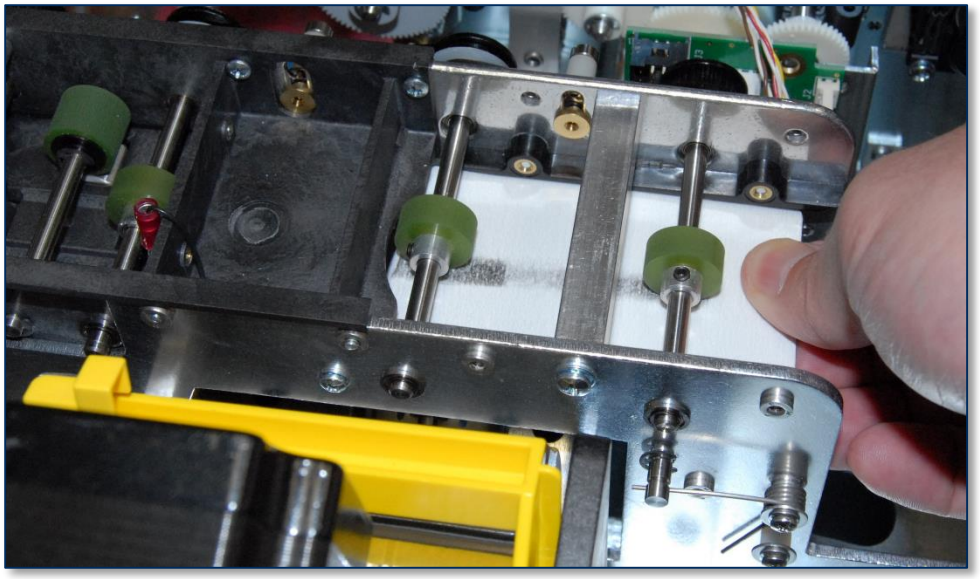


Figure 3-3 - Cleaning the Right Side of the Exit Transport (TOP VIEW FROM FRONT)

d) Feed the card partly under the exit ramp rollers and press the **Exit Eject** button. Hold the card there until the rollers stop moving.

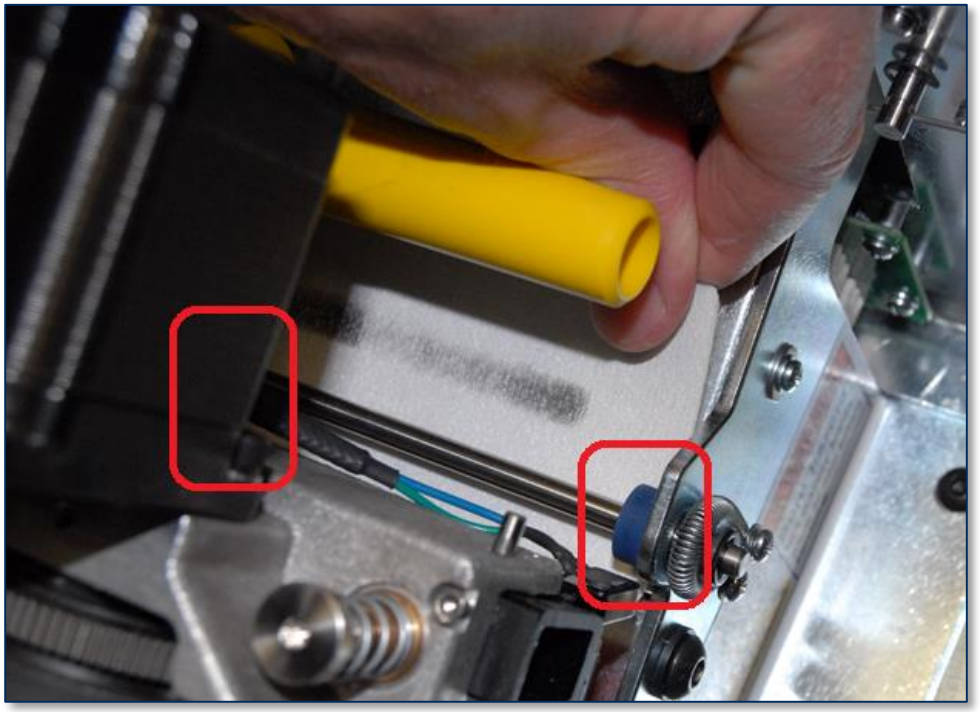


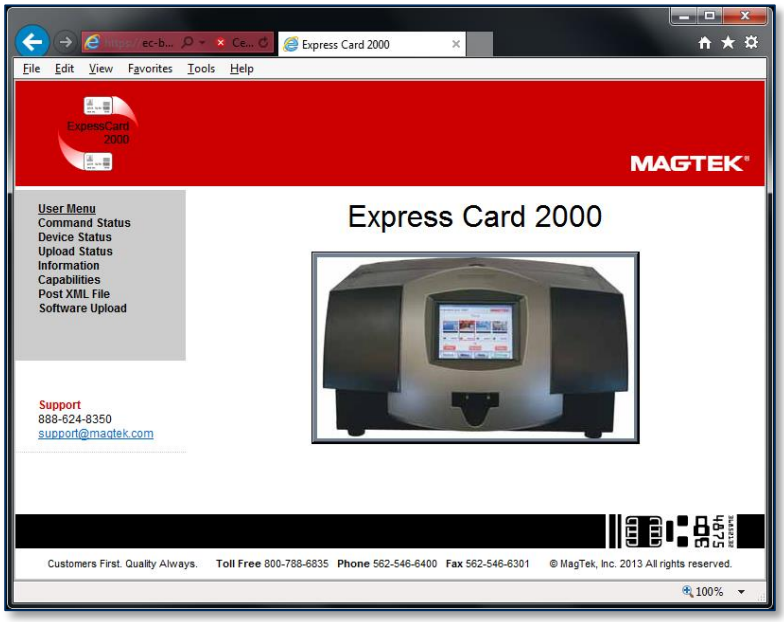
Figure 3-4 - Cleaning the Exit Ramp Rollers (TOP VIEW FROM FRONT)

5) Press the **Status** button to return to the **Status** page.
6) Re-install the tipper foil spool assembly with the original tipper foil roll, or obtain and install a new one from the customer.
7) Re-install hoppers 1 and 2.

3.4 Update the Software

If MagTek Support Services has supplied .CAB files to apply EC2000 software patches, follow these steps to install them:

1) Use the Ethernet cable to connect the service laptop to the EC2000. If necessary, you may instead use the customer's instant issuance workstation, provided it has Microsoft Internet Explorer and a USB port with security settings that allow you to read from the USB thumb drive.
2) Launch the Internet Explorer web browser and navigate to **https://ec-xxxxxxx**, where xxxxxxx is the device's serial number. The browser should show an **ExpressCard 2000** web interface page.



3) Open the **Software Upload** link on the left side of the page to display a **File to Upload** page.
4) Press the **Browse…** button to launch the **Choose File to Upload** dialog box.
5) Navigate to the folder that contains the .CAB files you want to apply (such as the field service laptop's hard drive or the USB thumb drive).
6) Select the .CAB file you want to apply, and press the **Open** button to return to the **File to Upload** page.
7) Press the **Send** button to upload the .CAB file to the device. The browser will display a status message telling you when the patch will be applied (for example, "File Copied Successfully. Update will be performed during next reboot."). The device's touchscreen may also go blank.
8) Restart the device by powering it off, then powering it on. Wait until the touchscreen once again displays the ExpressCard 2000 **Status** page.
9) In the web browser, open the **Upload Status** link on the left side of the page. If the browser reports "SUCCESS," repeat these steps for any additional patch .CAB files you need to apply, or continue to the next section.

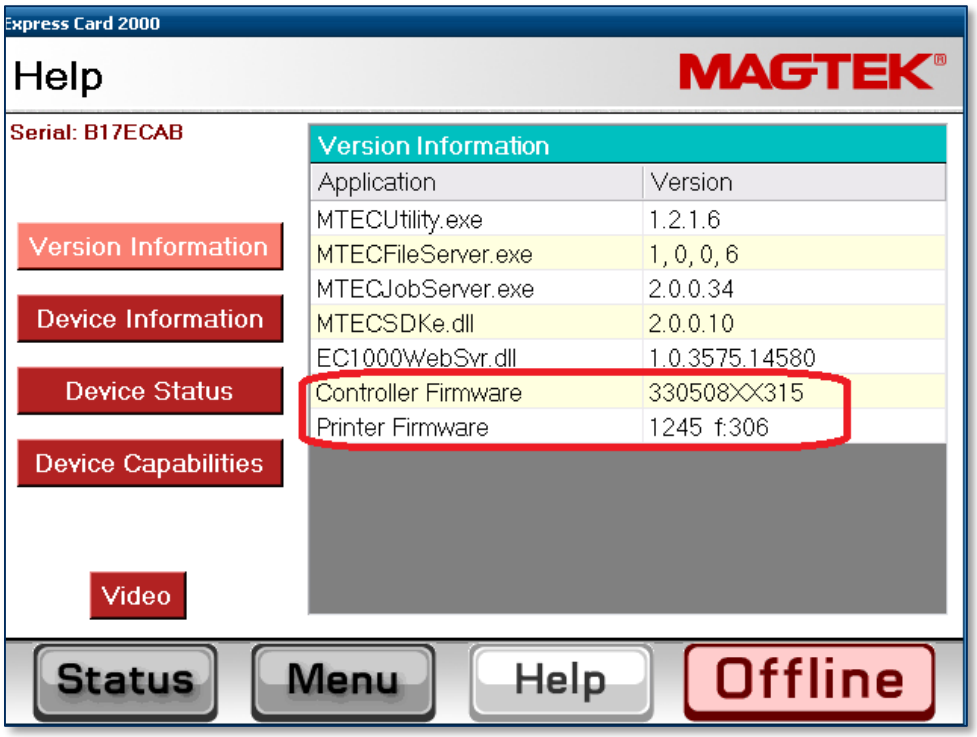
3.5 Update the Firmware

Follow the steps in this section to determine whether the EC2000 firmware needs to be updated, and to update it if necessary.

3.5.1 Check Firmware Revision Numbers

To check whether the EC2000 has the latest main logic board (MLB) and image printer firmware installed, follow these steps:

1) Install any software updates MagTek Support Services has provided, using the instructions in section **3.4 Update the Software**. This is a very important first step, because new revisions of firmware files are distributed to the EC2000 via software updates.
2) From the EC2000 touchscreen, press the **Help** button to open the **Help** page.
3) In the **Version Information** list, note the **Controller Firmware** and **Printer Firmware** entries.

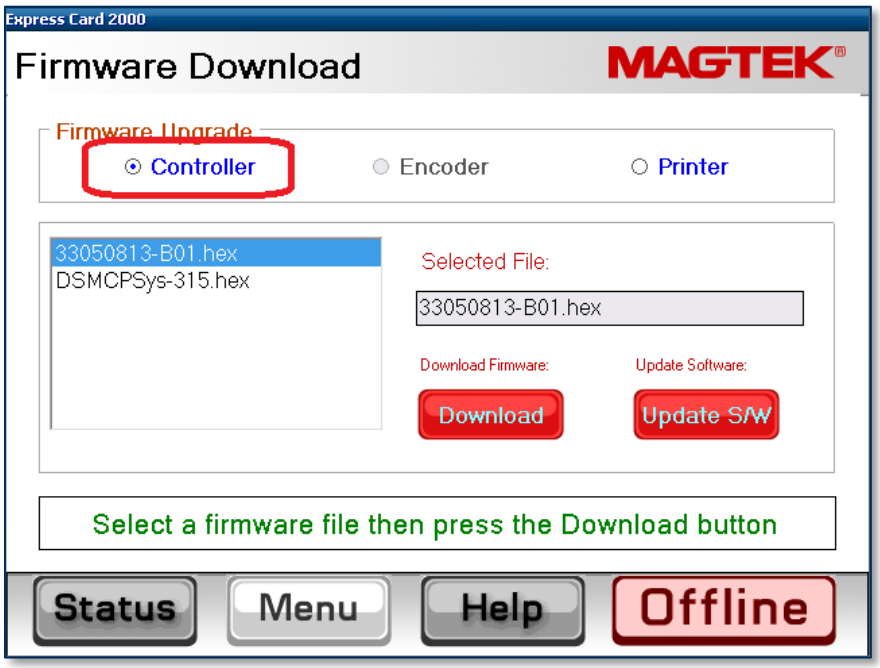


4) Press the **Menu** button to launch the **Main Menu** page.
5) Press the **Settings** button to launch the **Settings Menu** page.
6) Press the **Load F/W** button to launch the **Firmware Download** password page.
7) Use the on-screen keyboard to enter the password **1234567**, then press the **E** key to launch the second **Firmware Download** password page.
8) Use the on-screen keyboard to enter the password **7654321**, then press the **E** key to launch the **Firmware Download** page.
9) Note the revision numbers listed for each **.hex** file in the list. If any revision number does not match the revision numbers you found on the **Help** page, update the firmware for that component using the steps in the following sections.

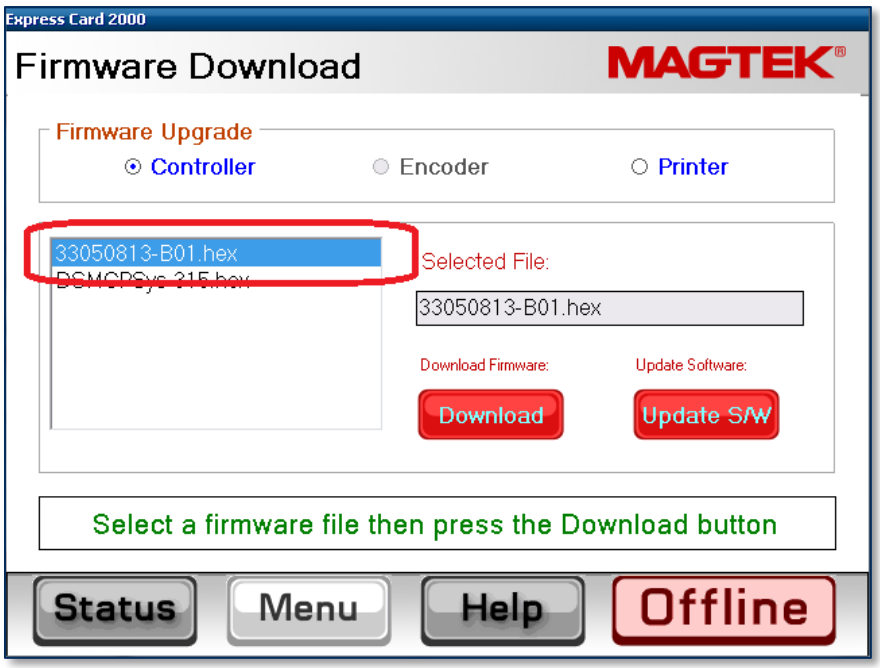
3.5.2 Update the Main Logic Board (Controller) Firmware

To update the controller (main logic board / MLB) firmware, follow these steps:

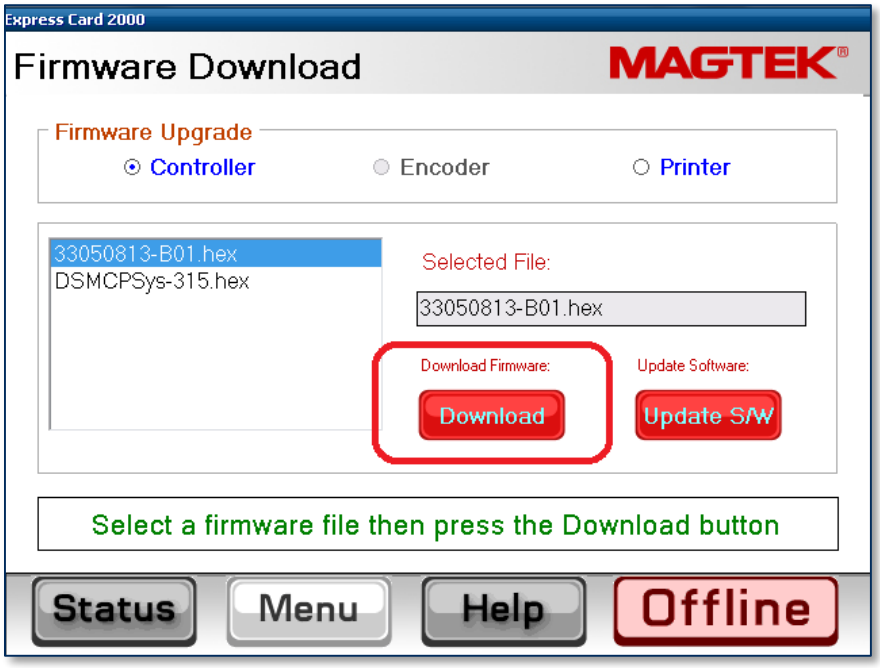
1) From the **Firmware Download** page, select the **Controller** radio button.



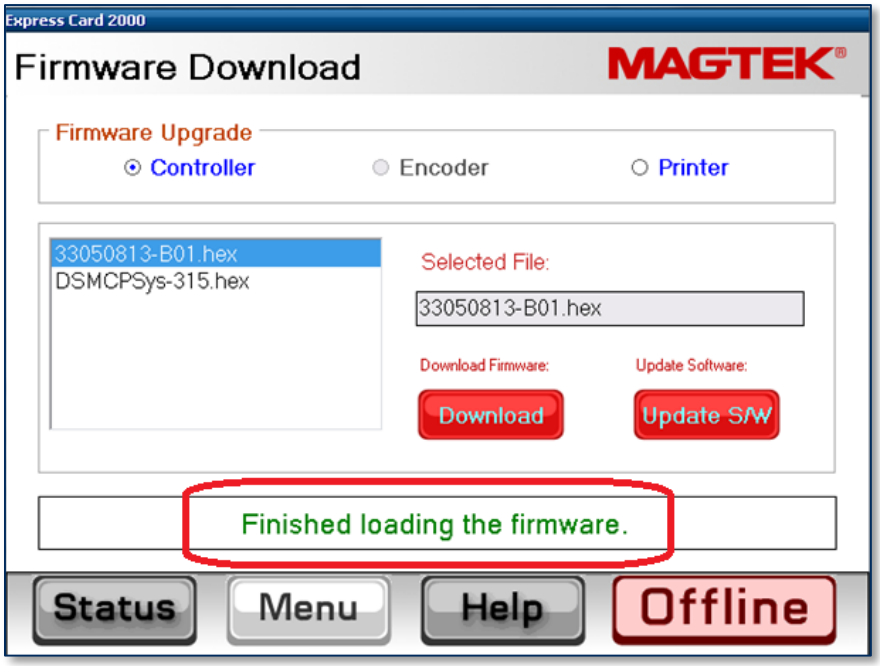
2) In the list of .hex files, select the file that corresponds to the new revision.



3) Press the **Download** button to download the .hex file to the controller. The system will report "Loading the firmware. Please wait…."



4) Wait about 5 minutes for the firmware to finish downloading. **Do not power off the device**.
5) After the firmware update is complete, the device will make sounds as the MLB resets. Wait until the sounds stop and the touchscreen reports "Finished loading the firmware."



3.5.3 Update the Printer Firmware

To update the printer firmware, follow the steps from section **3.5.2**, but select the **Printer** radio button and select the .hex file appropriate to the revision of the image printer firmware you want to install, before pressing the **Download** button.

3.6 Service the Hopper Module

Follow these steps to service the hopper transport:

1) Use the **MCP Commands** page (see section **2.9 How to Use Maintenance Functions On the Touchscreen**) to move the hopper transport from the front to the rear of the device to verify the movement is smooth and there is no belt slippage.
2) Only if the hopper transport rods are dirty, wipe off the dirt with a soft, lint-free cloth.
3) Check the hopper transport drive belt for signs of damage. If it is damaged, contact MagTek Support Services for a replacement.

3.7 Service the XY Transport Module

Do not lubricate the EC2000's gears or bearings. They are made of self-lubricating powder metal, and lubricants can damage their surfaces.

Follow these steps to lubricate the one shaft that requires lubrication. **Do not use Tri-Flow lubricant on any shaft other than the one shown below.**

1) If there is dirt, dust, or debris on the XY transport rods, wipe it off using a soft, lint-free cloth.
2) Use the **MCP Commands** page (see section **2.9.1 How to Use the MCP Commands Page**) to move the XY transport from the front to the rear of the device to verify the movement is smooth and there is no belt slippage. Leave the transport at the rear of the device.
3) Check the XY transport drive belt for any signs of damage. If it is damaged, contact MagTek Support Services for a replacement.
4) Stand at the front of the device and locate the XY transport shaft closest to the image printer. It is the only shaft that has a blue bearing around it (see **Figure 3-5**).

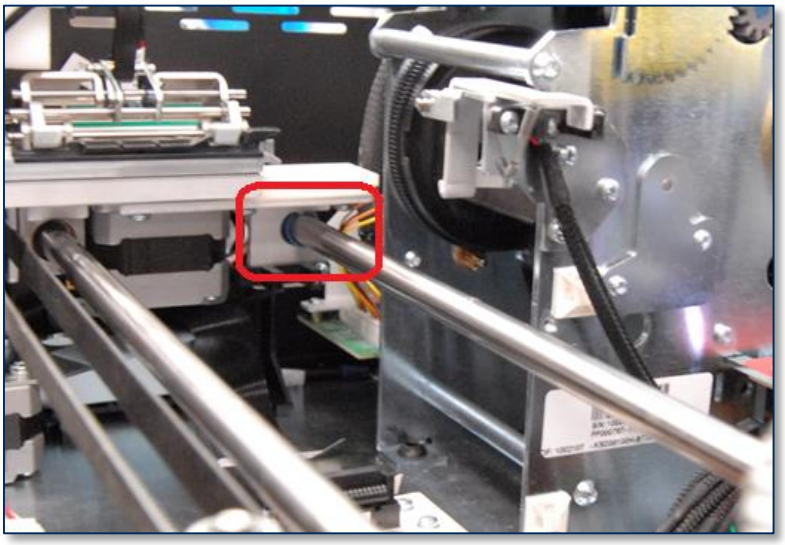


Figure 3-5 - Blue Bearing On XY Transport (FRONT LEFT VIEW)

5) Shake the bottle of Tri-Flow lubricant and remove the cap.
6) Run a thin 3-4 inch long bead of Tri-Flow along the top of that one shaft.

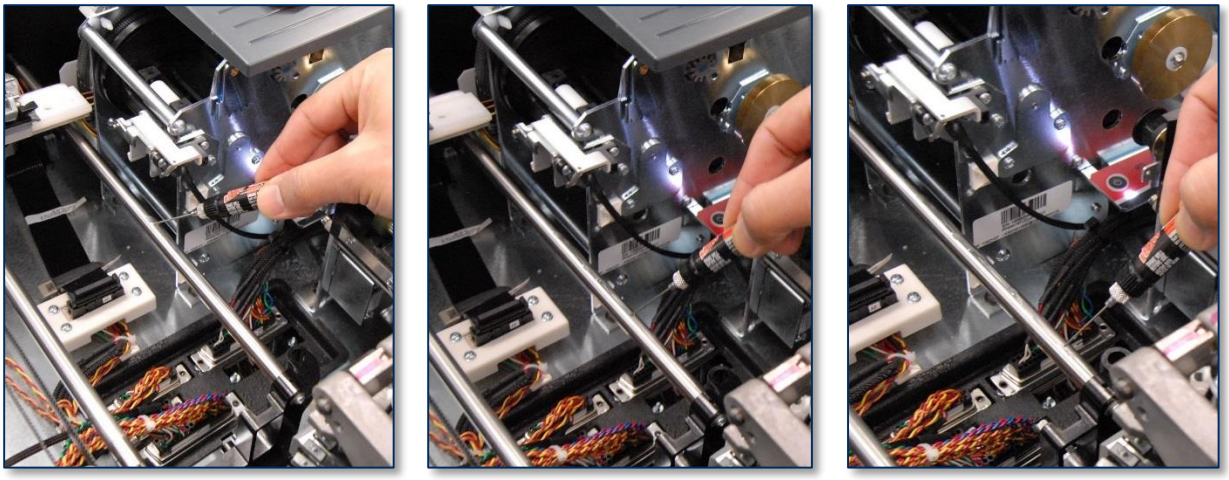
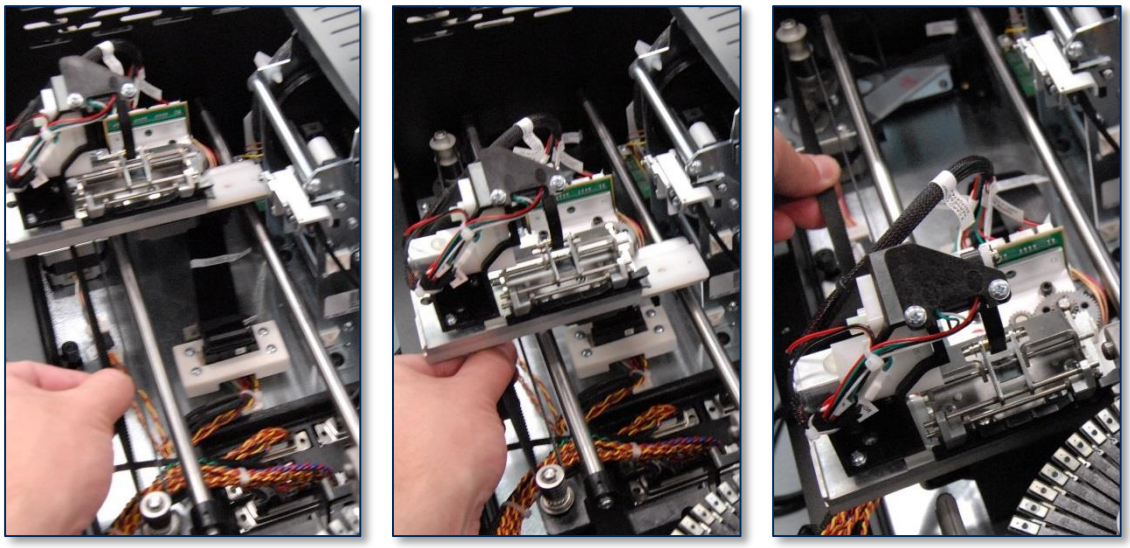


Figure 3-6 - Run a Thin Bead of Tri-Flow Along the Top of the Shaft (TOP LEFT VIEW)

7) Use the drive belt to move the XY transport to the front of the device, then to the rear again to spread the Tri-Flow along the length of the shaft (see section **2.8 How to Safely Move Transports By Hand**).



8) If you have applied too much Tri-Flow to the shaft, some may drip off the shaft. If this happens, dab off the excess with a clean, lint free cloth.

3.8 Service the Exit Transport Module

No additional service is necessary for the Exit Transport, other than the roller cleaning described in section **3.3 Clean All Transport Rollers**.

3.9 Cool the Tipper Heater / Power Down the Device

1) Navigate to **Menu** > **Settings** > **Tipper** to open the **Tipper** page.
2) Press the **Set Heater OFF** button to turn off the tipper heater.
3) Note the value under Current Tipper Temp. **If the tipper temperature is 50°C or hotter, the tipper heater is not safe to touch.**
4) Take note of the current time, and plan your work to allow enough time for the tipper heater to cool, which can take up to 15 minutes. You may be able to use compressed air to cool it more quickly.
5) Power down the device.

3.10 Clean Inside the Device

Caution: Do not use alcohol wipes, liquids, or chemicals on the touchscreen.

Clean the device in phases to avoid blowing dirt, dust, or debris into sensitive components:

1) Remove all remaining consumables from the device (stock cards, image printer ribbon, indent cartridge[s], tipper foil, etc.) and set them aside in a secure location or give them to the customer for temporary storage or secure disposal.
2) If there is a large, visible amount of dirt, dust, or debris in the device, wipe the worst of it out with a clean, dry cloth.
3) Wipe remaining dirt, dust, and debris off the base plate and main components with alcohol wipes.
4) Used compressed air to blow out any remaining dirt, dust, or debris from between components and re-wipe as necessary.
5) Use compressed air to clean each of the sensors (see section **2.9.2 How to Use the Sensor Utility Page** for an inventory of all sensors in the device).
6) Use compressed air to clean out the electronics in the bottom between the side access doors, with special attention paid to the power supply in the rear left corner.

3.11 Service the Image Printer Module

Follow these steps to service the image printer:

1) Make sure the interior of the EC2000 is clean (see section **3.10 Clean Inside the Device**). Performing image printer maintenance with dirt or debris inside the cover may damage the printer.
2) Open the image printer and clean its interior if necessary. Dust and other particles are attracted to the image printer ribbon or card stock by static produced during image printing, and can contaminate image-printed cards, causing spots or speckles.
3) Clean the card cleaning roller and replace it if necessary (see ***99875600 ExpressCard 2000 User Installation and Operation Manual*** for details).
4) Clean the image print head with head cleaning pen (see ***99875600 ExpressCard 2000 User Installation and Operation Manual*** for details).
5) Check handoff from image printer to XY transport. Adjust if needed (see section **5.3.2 How to Calibrate Printer to XY Transport Handoff**).

3.12 Service the Embosser Module

3.12.1 About Servicing the Embosser Module

The embosser module presses characters into card stock by squeezing the card between a raised metal letter, called a **punch**, and an indented letter of the same shape, called a **die**, installed on the embosser's top and bottom daisy wheels. For indented characters, the die is replaced with a flat metal plate so the card stock is only altered on the character side. Worn out punches or dies can produce characters of poor quality, or characters that are raised/indented less than the required depth.

The top and bottom embosser motors each drive a **hammer** that applies force to the punches and dies on the daisy wheel. Both hammers have a small round plate with a hole that lines up with a cone on each character. The cone on each character should be sharp and unbent, and must line up properly with the hole in the hammer. **Figure 3-7** shows a magnified view of a properly aligned hammer (above) and die (below), viewed from the front of the embosser. Because it can be difficult to see the front of the embosser module with the EC2000's cover and other modules installed, it is best to inspect the cones with an inspection mirror. Section **3.12.2** provides further detail.

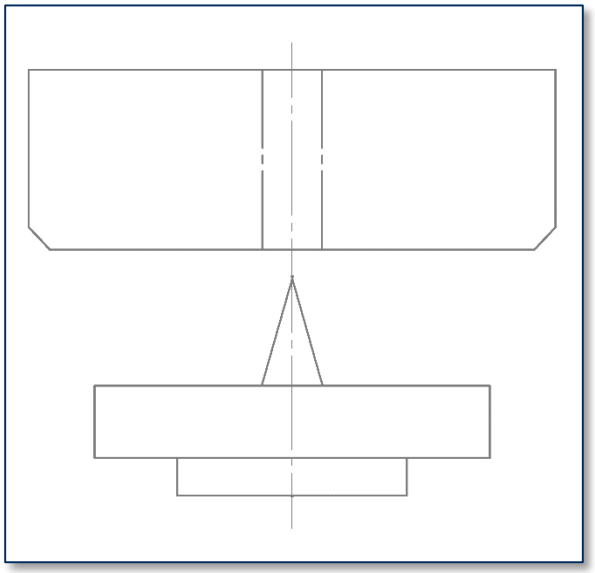


Figure 3-7 - Embosser Hammer and Character (FRONT VIEW)

3.12.2 How to Service the Embosser Module

Service the embosser by following these steps. If you discover any issues you can not resolve, contact MagTek Support Services to procure a replacement embosser module.

1) Use compressed air to clean the embosser bridge (the metal block between the daisy wheels that supports the indent cartridge ribbon).
2) Inspect the top and bottom embosser daisy wheels for missing or worn characters and replace them if possible (see section **4.10 How to Remove / Re-install Embosser Fonts**). After installing, make sure the tine is still intact and holds the character tightly.
3) Inspect the top and bottom embosser daisy wheels for missing, bent, or broken **tines**. Install any missing characters on other tines and re-map them after preventive maintenance is complete and the device is powered up (see section **4.10 How to Remove / Re-install Embosser Fonts** and section **2.9.4 How to Use the Character Mapping Page**).
4) Inspect the characters on the **top** embosser wheel to identify any broken or bent **cones**. Top-side replacement font sets include:
   a) 33070077 FUN TYPE,FARRINGTON F7B,EMBOSS DIE
   b) 33070079 FUN TYPE,GOTHIC,ALPHA,EMBOSS DIE,ZERO/OH
   c) 33070181 FUN TYPE,GOTHIC,NUMBER,EMBOSS DIE
   d) 33070183 FUN TYPE,GOTHIC,SPECIAL CHARACTERS,EMBOSS DIE
   e) 33070516 FUN TYPE, FRONT INDENT SANS SERIF, 12PT
   f) 33070524 FUN TYPE, INDENT, HELVETICA 8PT
   g) 33070546 FUN TYPE, FRONT INDENT SANS SERIF, 14PT
   h) 33070581 FUN TYPE, TURKISH EMBOSS DIE
   i) 33070075 FUN ANVIL, REAR INDENT.
5) Use the inspection mirror and a flashlight to inspect the characters on the **bottom** embosser wheel to identify any broken or bent **cones** (see **Figure 3-8** and **Figure 3-9**). Bottom-side replacement font sets include:
   a) 33070078 FUN TYPE,FARRINGTON F7B,EMBOSS PUNCH
   b) 33070080 FUN TYPE,GOTHIC,ALPHA,EMBOSS PUNCH, ZERO/OH
   c) 33070081 FUN TYPE,REAR,INDENT,MC,ZERO
   d) 33070182 FUN TYPE,GOTHIC,NUMBER,EMBOSS PUNCH
   e) 33070184 FUN TYPE,GOTHIC,SPECIAL CHARACTERS,EMBOSS PUNCH
   f) 33070582 FUN TYPE, TURKISH EMBOSS PUNCH
   g) 33070608 FUN TYPE FRONT INDENT BANK ID NUMBER
   h) 33070074 FUN ANVIL,FRONT INDENT

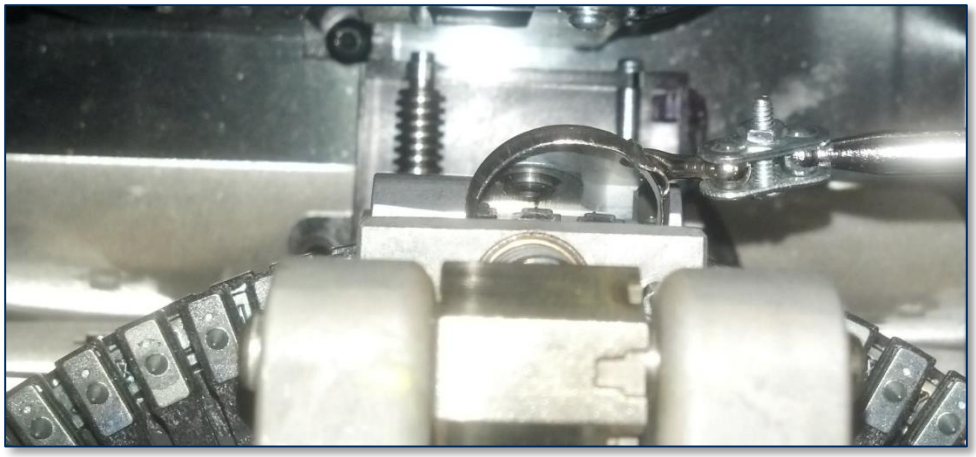


Figure 3-8 - Using Inspection Mirror to Check Tine / Hammer Alignment (TOP VIEW FROM FRONT)

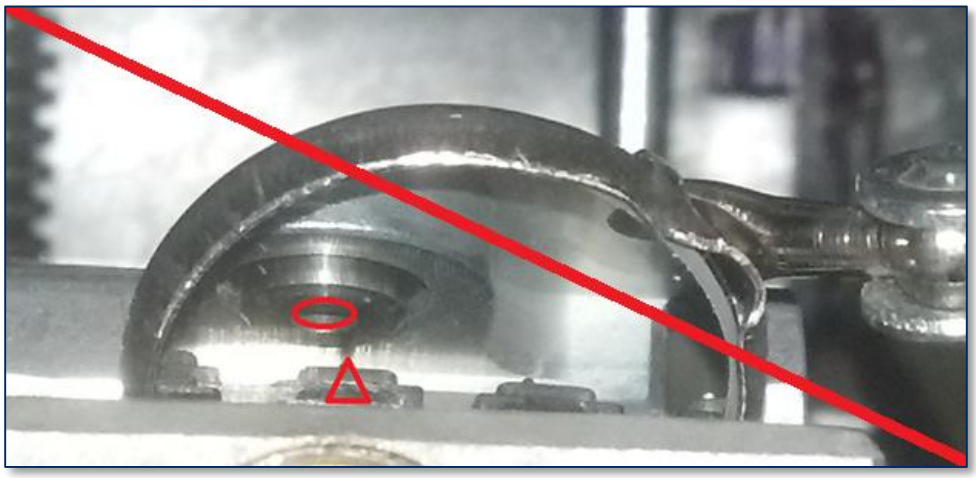


Figure 3-9 - Bad Embosser Wheel Alignment (Figure 3-8 MAGNIFIED)

6) If any cones are broken or bent, replace the characters in the same location if possible. If replacement is not feasible, cut off the top and bottom tines using the diagonal side cutters, remove the character from the tines, and install it to another set of tines, and re-map the character to another tine after preventive maintenance is complete and the device is powered up (see section **4.10 How to Remove / Re-install Embosser Fonts** and section **2.9.4 How to Use the Character Mapping Page**).
7) Check the daisy wheel alignment by standing in front of the device and looking straight down at the embosser. Use an inspection mirror as shown in **Figure 3-8** so you can see the cone on the bottom of the current character and the hole in the embosser hammer. **Figure 3-9** shows a cone and hole that are not properly aligned.
8) Check embossed character heights using the steps in section **5.4 How to Calibrate the Embosser**, and adjust them if necessary to account for normal wear. Pay special attention to any characters you have replaced or re-mapped.

3.13 Service the Electronics

Visually inspect all wires and cables, checking for insulation breakage or wear on moving cables.

3.14 Service the Cover

After completing all other service, service the cover as follows:

1) Inspect the cover for damage.
2) Clean the black and gray portions of the outside of the cover with alcohol wipes.
3) Clean fingerprints off the touchscreen with a soft, clean, dry cloth.

3.15 Perform Final Tests

After completing preventive maintenance, follow these steps to test the device and restore it to its original state:

1) Re-connect the power and network cables.
2) Re-attach any security hardware.
3) Re-install consumables.
4) Close all open doors.
5) Power up the device.
6) Re-synchronize the image printer ribbon.
7) Create a sample card using customer card stock.
8) Check image print quality and embosser alignment, and adjust components as necessary using the information in section **5 Adjustments**.
9) Fill out the checklist included with the preventive maintenance kit, and return it to MagTek.

4 Removal and Re-installation

This section describes how to remove and re-install the major assemblies within the EC2000. To avoid personal injury or damage to the device, be sure to follow ESD procedures (see section **2.3 How to Handle ESD-Sensitive Parts**) and use standard safety practices.

4.1 How to Prepare the Device for Removing / Re-installing Modules

To prepare the device for removing / re-installing modules, follow these steps in accordance with standard safety practices:

1) Offer the customer the opportunity to remove any proprietary or security-sensitive consumables from the device, including card stock, image printer ribbons, indent cartridges, and tipper foils. Some consumables contain negative imprints of cardholder data and must be handled securely.
2) Make sure you have adequate lighting around the device, or plan to use a flashlight.
3) Make sure you have a safe location to place removed parts and replacement parts.
4) If the relevant replacement procedure requires you to use the touchscreen user interface, perform those steps while the device is still powered up and connected to the network.
5) Power down the device.
6) Disconnect the device's power cable from the AC socket-outlet, then disconnect the power cable and network cable from the rear of the device.
7) If necessary, unlock or disconnect any security hardware from the device.
8) If the replacement procedure requires you to remove the device's top access door or the entire cover, or requires rear access to the device, make sure you have adequate clearance around the device. Depending on the installation location, you may need to move the device to a service location.

4.2 How to Remove / Re-install the Top Access Door

Approximate time to remove: 5 minutes plus any sub-procedures Approximate time to re-install: 5 minutes plus any sub-procedures

The top access door is the large lockable door in the top of the cover that secures the user-serviceable areas inside the device, while allowing users to access and replace consumable items like image printer ribbons and card stock. Some service procedures require removing the top access door to give unobstructed access to certain components.

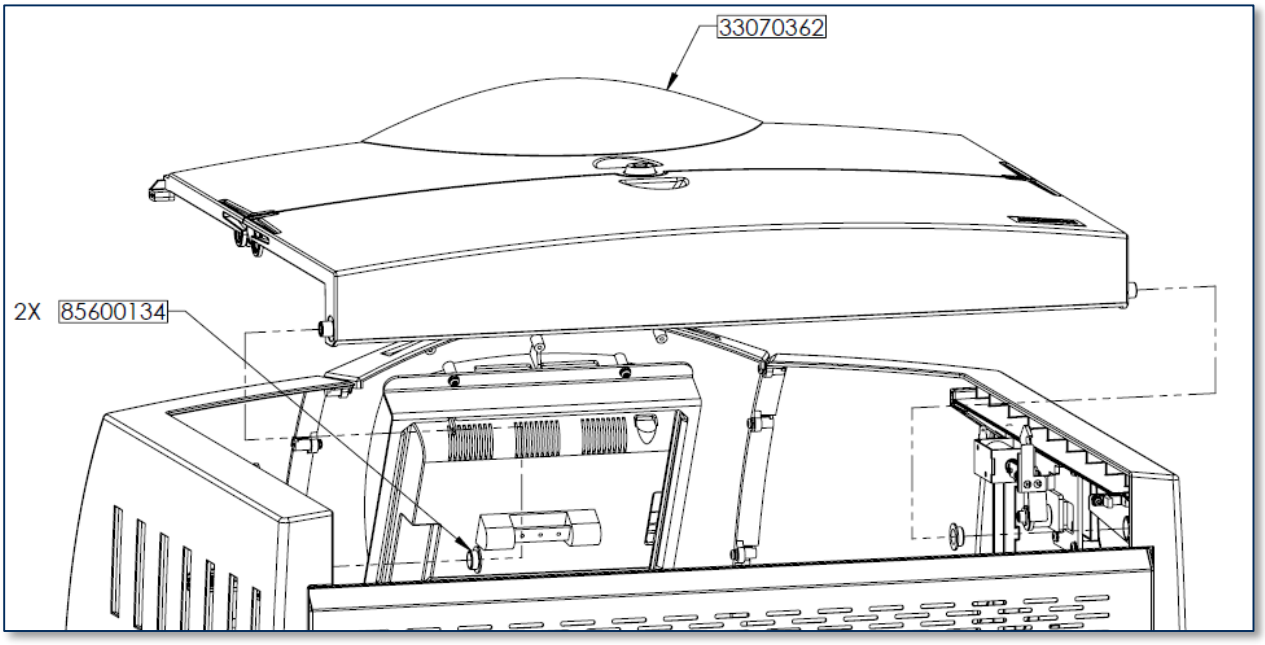


Figure 4-1 - Top Access Door (REAR VIEW)

To remove the top access door, follow these steps:

1) Unlock the top access door (see section **2.7 How to Open the Top Access Door**).
2) Open the top access door halfway (just past the latches on either side of the cover).

3) Using both hands, gently pull the top cover to the **right**, then slightly **upward** to free it from its left track as shown in **Figure 4-2**.

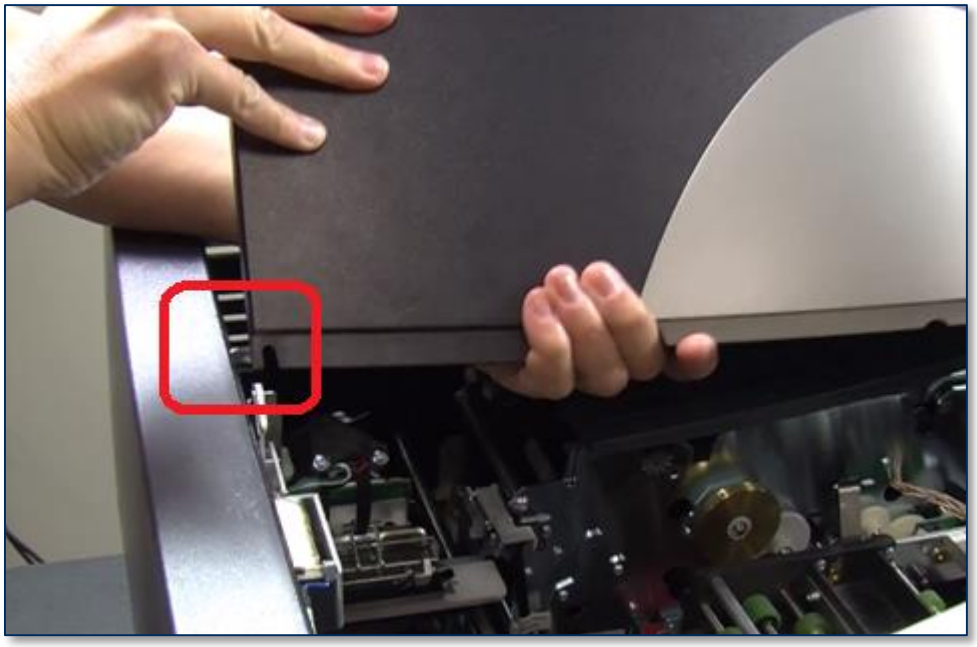


Figure 4-2 - Pulling the Left Side of the Top Access Door Out of Its Track (FRONT VIEW)

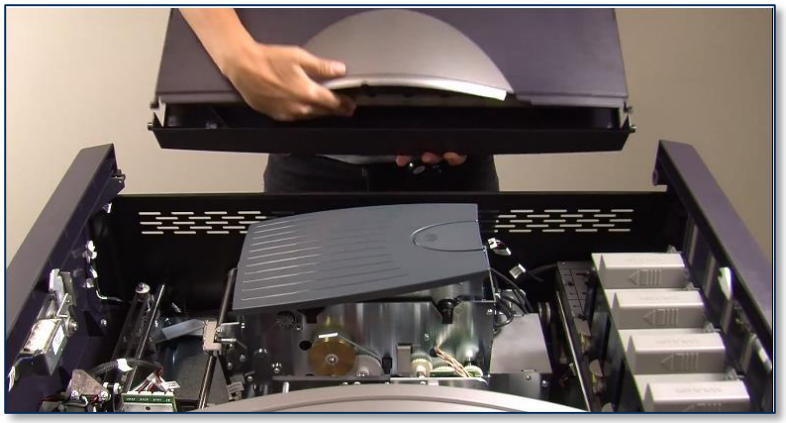
4) Repeat the process, pulling it to the **left** and slightly **upward**, to free it from its right track.
5) Lean the top access door out toward the rear of the device as shown.

Figure 4-3 - Top Access Door Leaning Up and Back (FRONT VIEW)

6) Move the hopper transport toward the front of the device, around hopper 6 (see section **2.8 How to Safely Move Transports By Hand**).
7) Remove card stock hoppers 1 and 2.
8) Locate the screw and washer that fasten the cover to the metal plate on the rear of the base. The fastener can be found in the rear upper right of the device behind hopper 1, as shown in **Figure 4-4**.

Figure 4-4 - Removing the Right Side Cover Screw Near Top Access Door Hinge (FRONT LEFT VIEW)

9) During the next step, hold the top access door with one hand or it may fall or break.
10) Use the No. 2 Philips screwdriver to loosen the fastener.
11) Remove the top access door and set it aside with the two screws and washers (if necessary, move the XY transport out of the way per section **2.8 How to Safely Move Transports By Hand**).



12) Remove the bushings from the top cover's two hinges (one on each side) and set them aside with the cover and the two screws and washers.

Figure 4-5 - Top Access Door Hinge Bushings (FRONT LEFT VIEW)

To re-install the top access door, reverse the steps for removing it. Be careful not to lose the door's bushings, which are not secured to the cover or to the top access door's hinges.

4.3 How to Remove / Re-install the Side Access Doors

Approximate time to remove: 5 minutes plus any sub-procedures
Approximate time to re-install: 5 minutes plus any sub-procedures

The side access doors secure the control electronics (embedded PC, power supply, power controller, and main logic board) inside the device:

- The **right side access door** gives easy access to the embedded PC's connectors, including Ethernet and USB ports (for example, to plug in a keyboard/mouse or USB thumb drive), and also provides access to examine or replace the Main Logic Board (MLB).
- The **left side access door** provides access to the power supply and the power controller board (sometimes referred to as the "Green controller"). It is less common to need to open the left side access door.

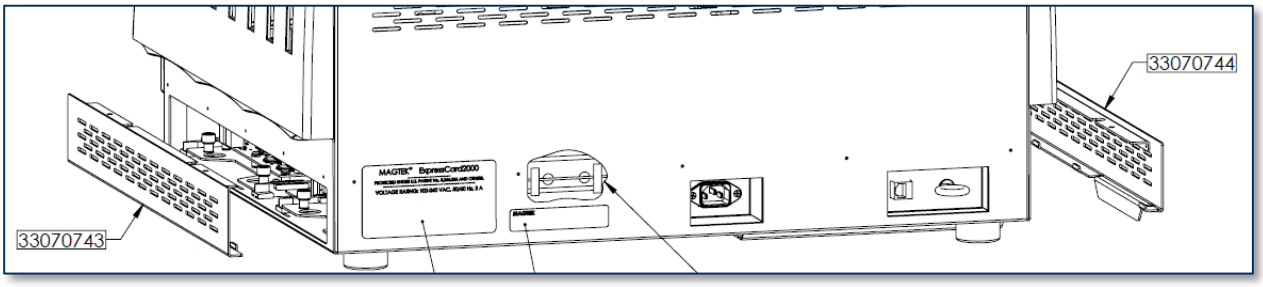


Figure 4-6 – Left and Right Side Access Doors (REAR VIEW)

To open the side access doors, follow these steps:

1) Prepare the device for replacing parts by following the steps in section **4.1 How to Prepare the Device for Removing / Re-installing Modules**.
2) Move the hopper transport to the front of the device near the manual feed slot (see section **2.8 How to Safely Move Transports By Hand**). This helps avoid damaging the hopper transport ribbon cable when removing the right rear thumb screw.
3) If you are removing the left access door, lift the left side of the EC2000 and prop up the two left rubber feet on a card weight atop a soft cloth or piece of cardboard. Be sure card weights do not stick out past the rubber feet toward the left edge of the device. Alternatively, you may move the EC2000 to the edge of the work surface so the left side of the device hangs 1" over the edge. This will make it easier to remove the left access door and will protect the surface you are working on.

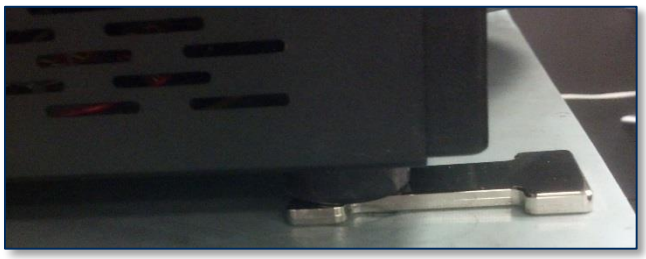


Figure 4-7 - Propping Up the EC2000's Feet (LEFT VIEW)

4) Open the top access door (see section **2.7 How to Open the Top Access Door**).
5) Using a flashlight, locate the two thumb screws in the base plate on the side you want to open. These screws lock into holes on the top of the side access door and hold it in place.

6) Being careful not to pinch any cables or wires between the screwdriver and the screw, use the long No. 2 Philips screwdriver to unscrew the two thumb screws.
7) Lower the side access door to free its bottom tabs from the cover, remove it, and set it aside (see **Figure 4-8**).

Figure 4-8 - Removing the Left Side Access Door (FRONT LEFT VIEW)

To close the side access doors, follow these steps:

1) Orient the side access door straight up and down like it will be on the EC2000 cover.
2) Slide the side access door's locking tabs into their slots on the bottom of the EC2000's cover. You may need to move it forward and back along the cover to find the place where the tabs insert.
3) Hold the side access door up (in place) with one hand.
4) Use the long No. 2 Philips screwdriver to tighten the **rear** thumb screw.
5) Use the long No. 2 Philips screwdriver to tighten the **front** thumb screw.
6) Tug on the side access door to make sure it is secure.
7) Remove any props under the device's feet, and return it to its original location.

4.4 How to Remove / Re-install the Cover

Approximate time to remove: 30 minutes plus any sub-procedures Approximate time to re-install: 45 minutes plus any sub-procedures

The EC2000 has a cover which secures the device's contents and provides mount points for the top access door and touchscreen, and incorporates the card output hopper and manual feed slot. Some service procedures require removing the device's cover to give unobstructed access to certain components.

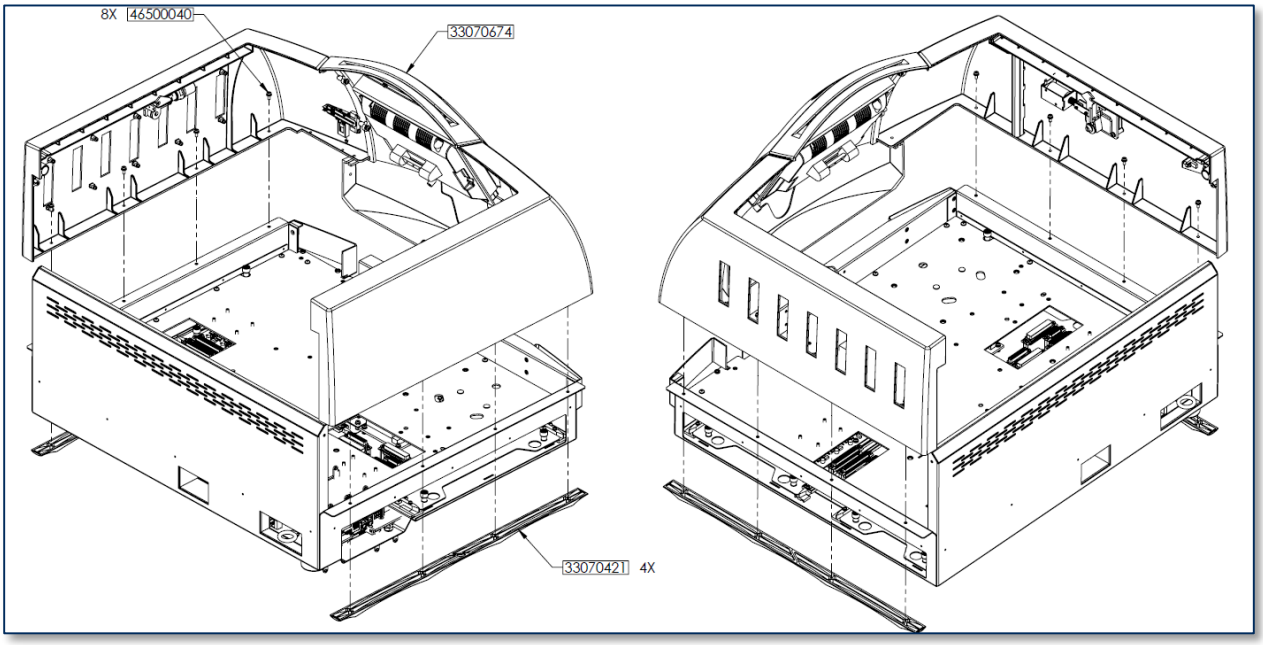


Figure 4-9 – Cover (REAR LEFT VIEW, REAR RIGHT VIEW)

Follow these steps to remove the cover:

1) Prepare the device for replacing parts by following the steps in section **4.1 How to Prepare the Device for Removing / Re-installing Modules**. At the end, the device should be powered down with all external cables safely disconnected.
2) Remove the top access door by following the steps in section **4.2 How to Remove / Re-install the Top Access Door**, including safely powering down and disconnecting external cables.
3) Remove the magnetic stripe reader by following the steps in section **4.20 How to Remove / Re-install the Magnetic Stripe Reader (MSR) Module**.
4) Remove all the card stock hoppers from the device and set them aside. Remember to move the hopper transport out of the way as you remove them (see section **2.8 How to Safely Move Transports By Hand** for more information).

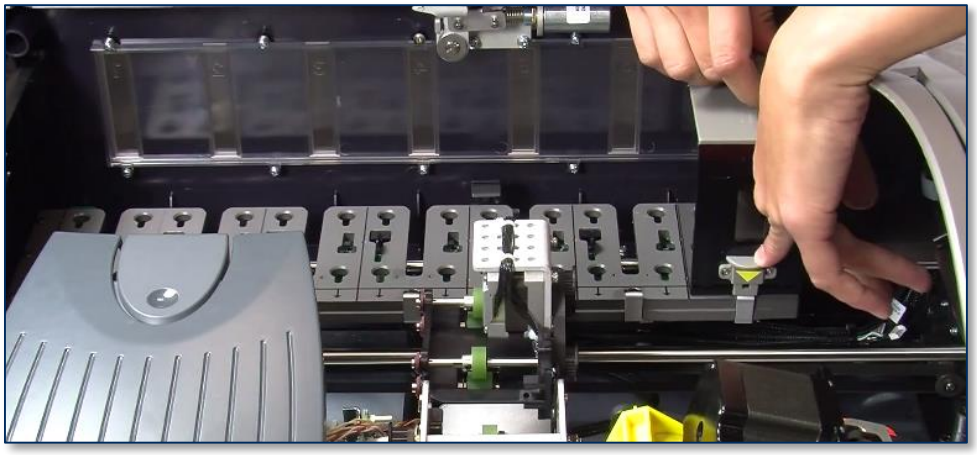


Figure 4-10 - Removing Card Stock Hoppers (LEFT VIEW)

5) Disconnect the BEZEL LED signal cable from the inside of the manual feed slot.

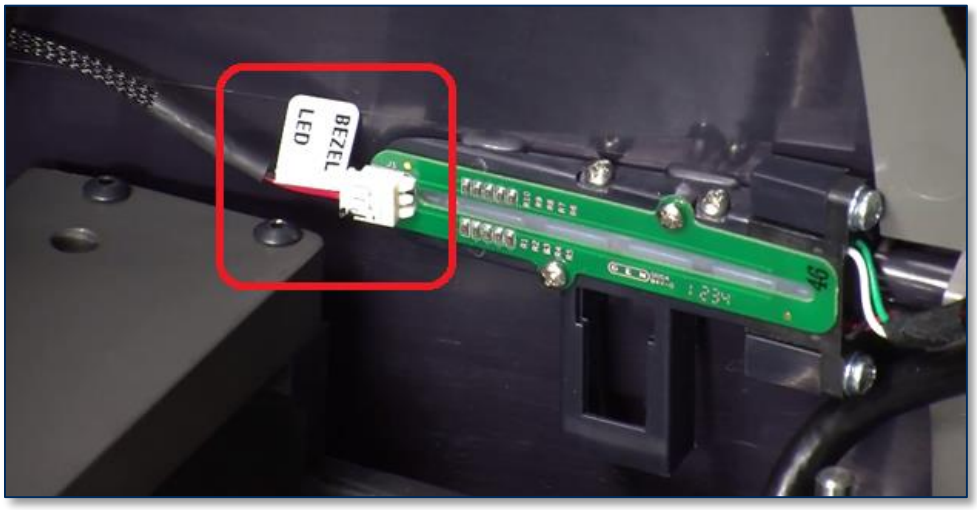


Figure 4-11 - Bezel LED Signal Cable (REAR VIEW)

6) Disconnect the Exception Card Entry sensor cable in the front right corner of the device.

Figure 4-12 - Exception Card Entry Sensor Cable (REAR VIEW)

7) Disconnect the Door 1 sensor cable in the front right corner of the device.

Figure 4-13 - Door 1 Sensor Cable (REAR VIEW)

8) Disconnect the touchscreen VGA video cable and the power cable from the rear of the touchscreen. If there is any silicone adhesive on the cables or their connections, remove it completely.

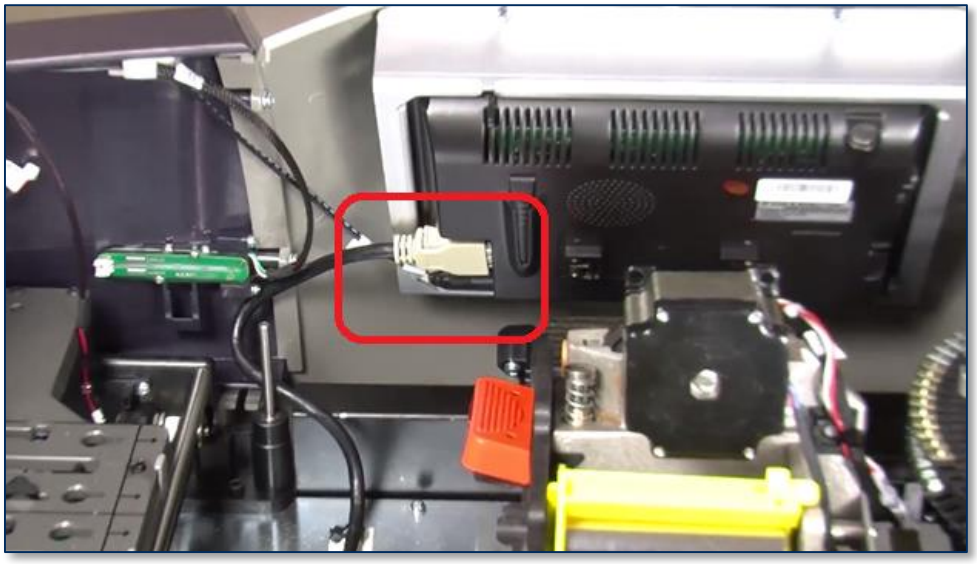


Figure 4-14 - Touchscreen VGA Cable and Power Cable (REAR VIEW)

9) If there are any cable ties anchoring the touchscreen cables to the cover, use the wire cutters or diagonal cutters to cut the cable ties, and replace them when re-installing the cover.

Figure 4-15 - Touchscreen Power and VGA Cables (REAR VIEW)

10) Disconnect the Top Case Open sensor cable in the rear left corner of the device.

Figure 4-16 - Top Case Open Sensor Cable (RIGHT VIEW)

11) Disconnect the Door 2 Solenoid cable connected to the top access door latch on the left side of the device. Disengage the bottom part of the cable from the clip on the wall of the cover.

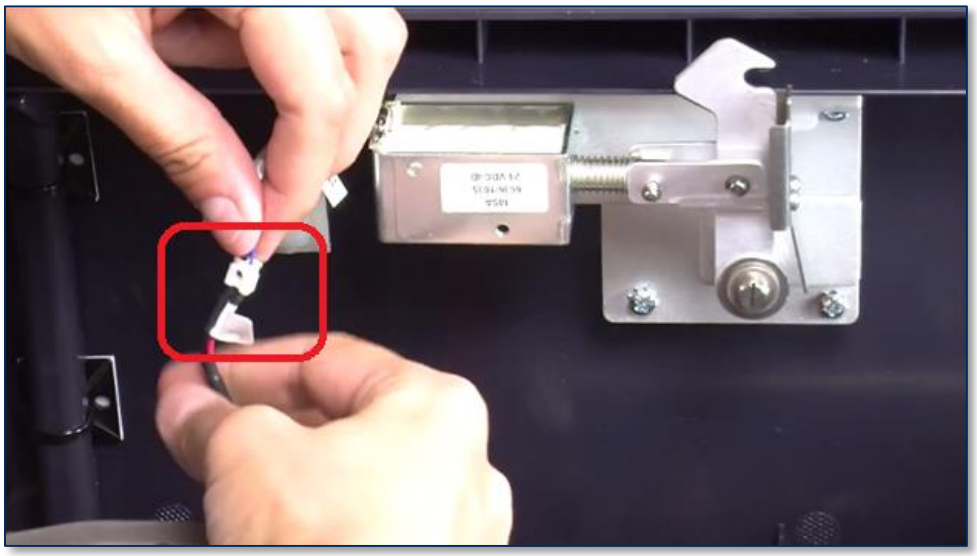


Figure 4-17 - Door 2 Solenoid Cable (RIGHT VIEW)

13) Use the No. 2 Philips screwdriver to remove the fastener that secures the cover to the metal plate on the rear face of the base. It can be found in the upper rear right of the device behind hopper 1, as shown in **Figure 4-17**.

Figure 4-18 - Removing the Right Side Cover Screw Near Top Access Door Hinge (FRONT LEFT VIEW)

14) Use the No. 2 Philips screwdriver to remove the screw and washer in the rear upper left of the device, opposite the fastener you have already removed (see **Figure 4-20**).

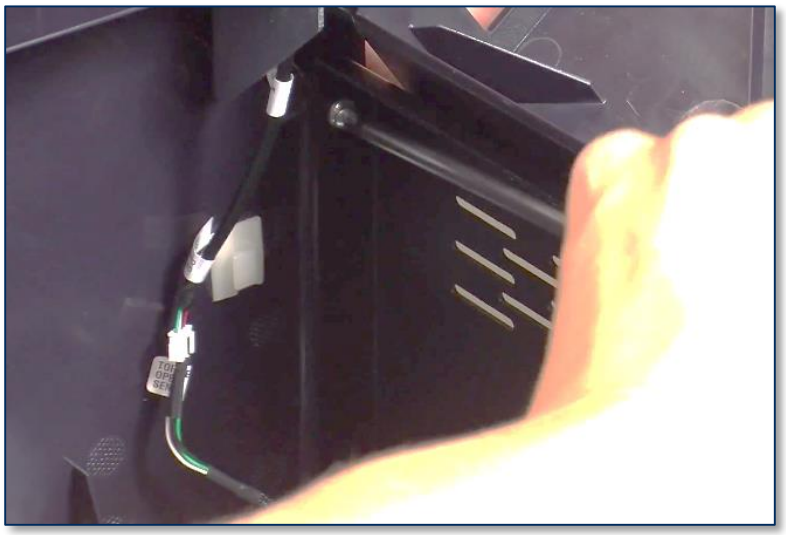


Figure 4-19 - Removing the Left Side Cover Screw Near Top Access Door Hinge (FRONT RIGHT VIEW)

12) Locate the eight screws and washers and four plastic plates that clamp the two sides of the cover to the top deck plate (see **Figure 4-9**).

13) Use the No. 2 Philips screwdriver to remove the screws, washers, and plates and set them aside. Note: The front two screws may be easier to remove with the No. 1 Philips screwdriver.

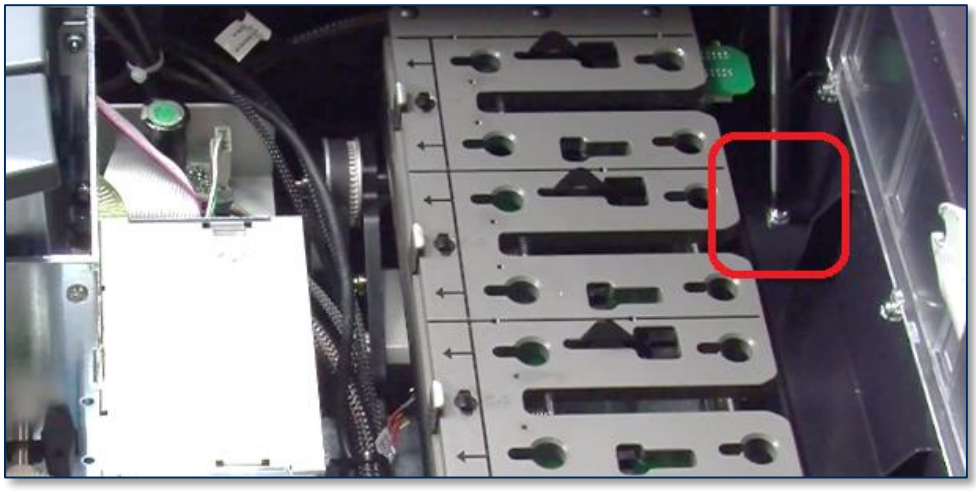


Figure 4-20 - One of Eight Screws On Sides of Cover (TOP VIEW FROM FRONT)

Figure 4-21 - Plastic Fastener Plates (LEFT VIEW)

14) Locate the two screws that secure the front of the cover next to the tipper.

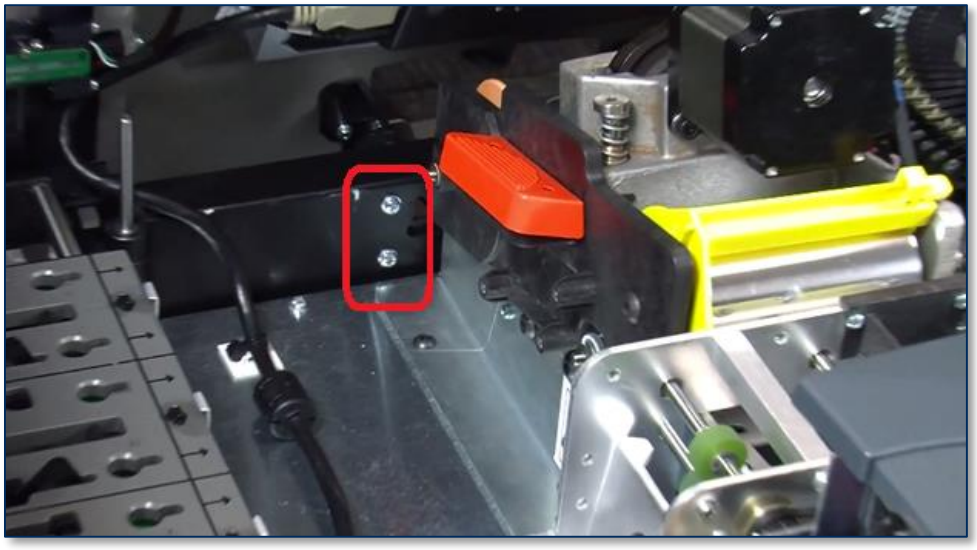


Figure 4-22 - Cover Screws Next to Tipper (REAR VIEW)

15) Use the No. 2 Philips screwdriver to remove the screws and set them aside.
16) Pull the silver portion of the cover forward slightly to release it from the device.
17) Carefully remove the cover by pulling it forward a few inches with both hands, making sure there are no cables tangled with it, then pull it toward the ceiling and set it aside.

Figure 4-23 - Removing the Cover (FRONT LEFT VIEW)

18) Perform any additional replacement or maintenance steps.

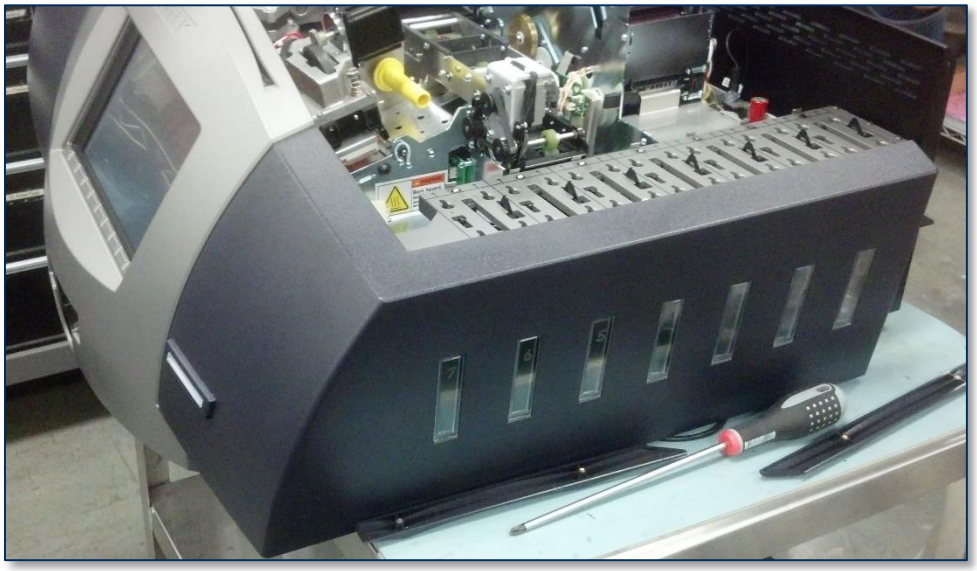
To re-install the cover, follow these steps:

Note: Re-installing the cover is an intricate, detailed procedure that can affect the security and functionality of the device. Perform each step carefully and methodically, and make sure everything is in place before proceeding to the next step.

1) Move any loose cables toward the center of the device so they will not be in the way of the cover.
2) Stand in front of the device and use both hands to slide the cover forward until it rests solidly on the base of the device and does not have to be held in place.

Figure 4-24 - Cover Resting On Top Deck (REAR VIEW)

3) Move the cover slightly to the right and rest its right side on the tabletop next to the device; this will give you easier access to the connectors around the hopper module.



4) Re-connect the cables you disconnected before removing the cover.
5) Re-tie or re-clip any cables you untied or unclipped before removing the cover.

6) Apply silicone adhesive to secure the touchscreen power and video cables as shown in **Figure 4-25**.

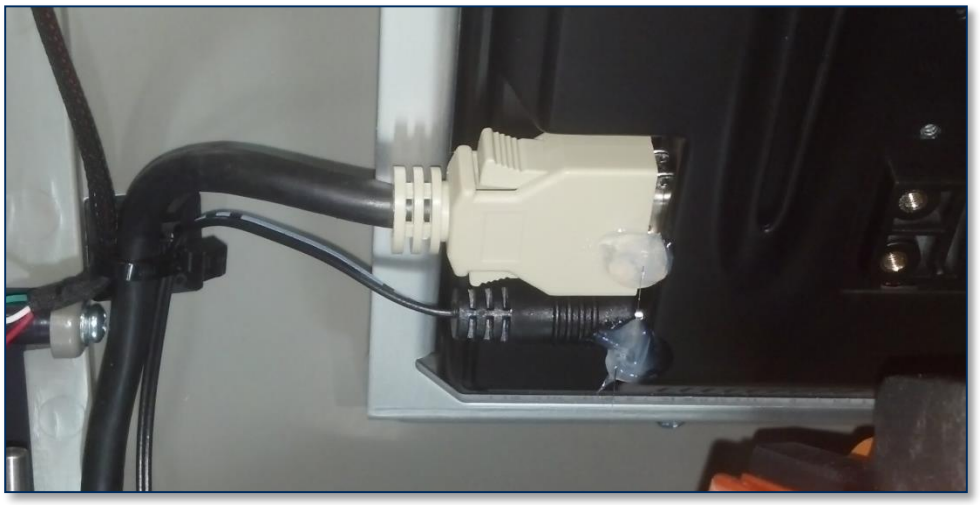


Figure 4-25 - Silicone Adhesive On Touchscreen Connectors (REAR VIEW)

7) Bring the cover back up to resting squarely on the base as shown in **Figure 4-24**.
8) Stand in front of the device and look straight down over the front. Locate the extension of the cover's card output hopper that will meet up with the end of the exit ramp (see **Figure 4-26**). Push that portion of the cover gently toward the floor and slide it slightly toward the rear of the device, just until the base of the device "captures" it.

Figure 4-26 - Card Output Hopper Touching Device's Base (REAR RIGHT VIEW)

9) Crouch in front of the device. Put a finger on each side of the lowest straight sides of the silver portion of the cover (see **Figure 4-27**). Squeeze each side inward carefully, and press toward the rear of the device until the base of the device "captures" them.

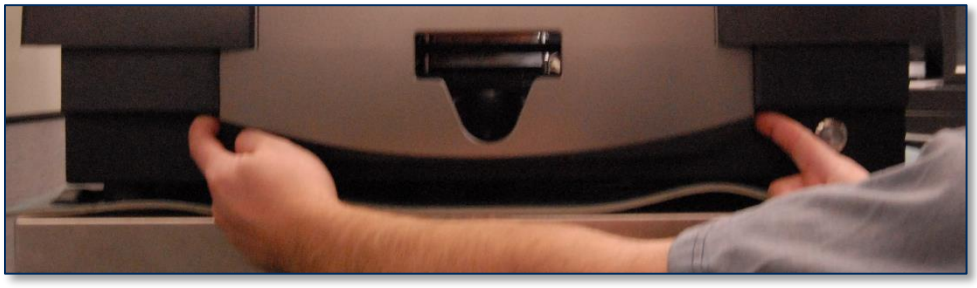


Figure 4-27 - Fitting the Silver Portion of the Cover (FRONT VIEW)

10) "Bump" the front of the silver portion of the cover (just to the right of the card output hopper) with the palm of your hand to firmly seat the cover in place.

11) Make sure the silver portion of the cover is solidly seated in the slot in the base, and that the darker portion of the cover is properly seated above it. See **Figure 4-28** for reference.

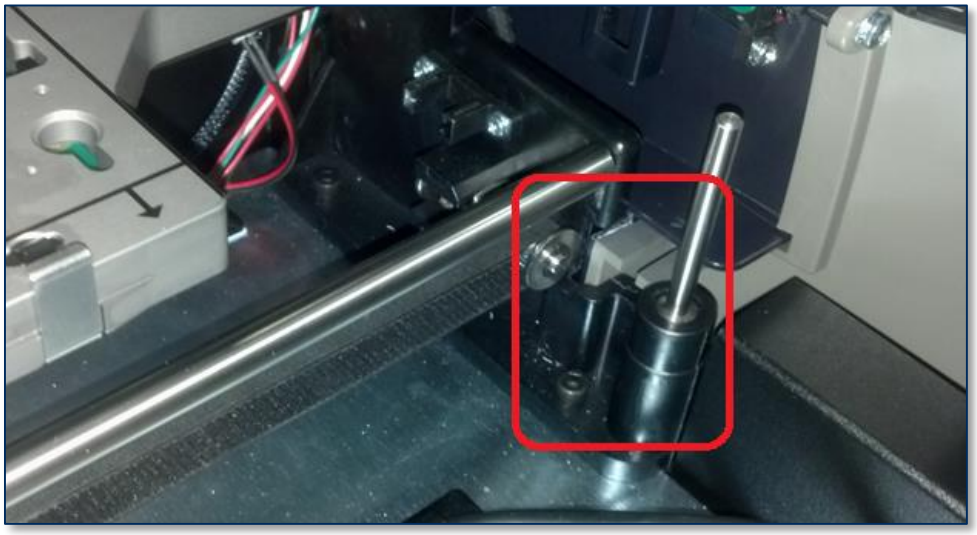


Figure 4-28 - Silver Portion of Cover Properly Seated (REAR LEFT VIEW)

12) Make sure the two sides of the cover roughly line up with their screw holes. This will align the screw holes in the front of the cover.

13) Use your fingers to insert the two screws that fasten the cover to the front of the device (see **Figure 4-22**), then use the No. 1 Philips screwdriver to loosely screw them into place to constrain the cover from moving left to right.
14) Loosely screw in the two screws that fasten the cover to the rear plate (see **Figure 4-18** and **Figure 4-19**) to constrain the cover from moving front to rear.
15) Fully insert the eight screws that fasten the cover to the base. Follow these helpful hints:
    a) Put a light below the screw holes before attempting to line them up.
    b) Use your free hand to push the cover into the right position to insert the screws.
    c) It may be helpful to use the magnetic retriever tool to insert them into the holes, then use the screwdriver or a finger to push them all the way in.
16) One by one, line up each of the plastic fastener plates below their matching screws, hold them in place, and tighten the screws. The diagonal portion of each fastener plate will be in the midline of the device as shown. Follow these helpful hints:
    a) The easiest tool to tighten the front corner screws is a screwdriver with a heavy-duty flex extension. If one is not available, they may be easier to tighten using the No. 1 screwdriver leaned flush against the inside corner of the cover's top opening.
    b) For each plate, fasten the midline screw first, then the corner screw.
    c) Look into the cover from above to put the screwdriver firmly into the screw head first, then crouch next to the device to line up the plate, then tighten the screw partway.
    d) Do not push the plates too hard toward the ceiling, or you may pop the screw out of its hole.
    e) Screw both screws partway into the plate before tightening them all the way.

Figure 4-29 - Front Left Fastener Plate (LEFT VIEW)

17) Tighten the remaining loose screws EXCEPT the top rear right (you will tighten that after re-installing the top access door).
18) Re-install the top access door by following the steps in section **4.2 How to Remove / Re-install the Top Access Door**.
19) Complete any other service that requires the device to be powered off and open.
20) Power up the device and test it, paying special attention to the following:
    a) Test the touchscreen and manual feed slot light and functionality by creating a sample card from the manual feed slot using the touchscreen.
    b) Make sure the device shows Offline on the **Status** page when the top access door is open.
    c) Test the electronic latches by testing the remote unlock function.

21) If the EC2000 does not power up or function properly, contact MagTek Support Services for assistance (see **Appendix A Technical Support**).

4.5 How to Remove / Re-install the Hopper Module

Approximate time to remove: 30 minutes plus any sub-procedures Approximate time to re-install: 30 minutes plus any sub-procedures

The hopper module holds the device's card stock hoppers and carries blank card stock to the image printer from the hoppers or from the manual feed slot. It is mounted to the top deck plate of the device along the right side.

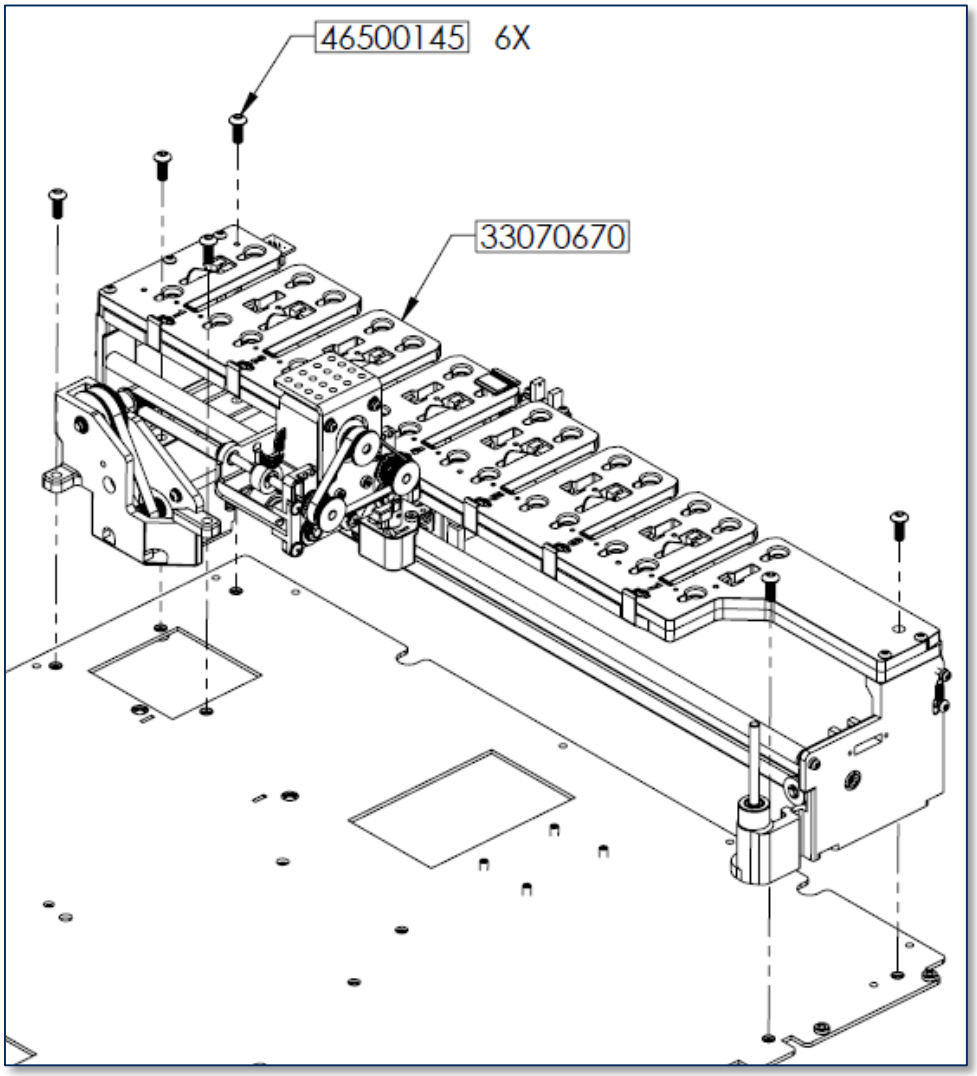


Figure 4-30 - Hopper Module (FRONT LEFT VIEW)

To remove the hopper module, follow these steps:

1) Prepare the device for replacing parts by following the steps in section **4.1 How to Prepare the Device for Removing / Re-installing Modules**. At the end, the device should be powered down with all external cables safely disconnected.
2) Remove the cover by following the steps in section **4.4 How to Remove / Re-install the Cover**.
3) Move the hopper transport to the front of the device, just past hopper 7 and before it rotates to the manual feed slot (see **Figure 4-31** and section **2.8 How to Safely Move Transports By Hand**).

4) Remove all the card stock hoppers and set them aside in a secure location, or give them to the customer for secure temporary storage.

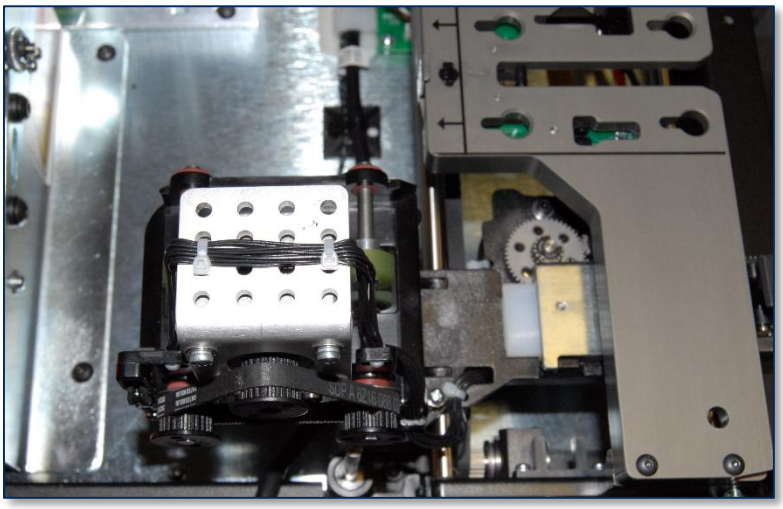


Figure 4-31 - Save Removal Location for Hopper Transport (TOP VIEW FROM FRONT)

5) Disconnect the two sensor cables from the rear right of the hopper deck (see **Figure 4-32**). Look at the labels or colors of each cable, noting which cable is plugged in to the connector closer to the front, and which is plugged in to the connector closer to the rear.

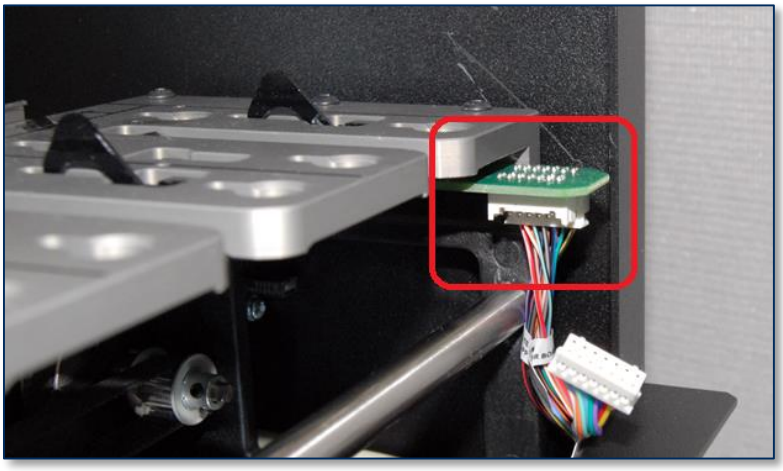


Figure 4-32 - Two Hopper Module Sensor Cables (FRONT RIGHT VIEW)

6) Locate the HOPPER SHUTTLE breakout circuit board mounted to the top deck plate below the center of the hopper module (see **Figure 4-33**).
7) Unplug the **HOME SENS** and **EXC HOME SENS** cables from the breakout board.
8) If **EXC HOME SENS** is routed underneath the breakout board, carefully thread it out and free it.
9) Trace the cables back to the hopper module and cut any cable ties holding them to the top deck plate. Leave the cut cable ties in place to mark the mount points, and to loosely hold any other cables you are not removing.

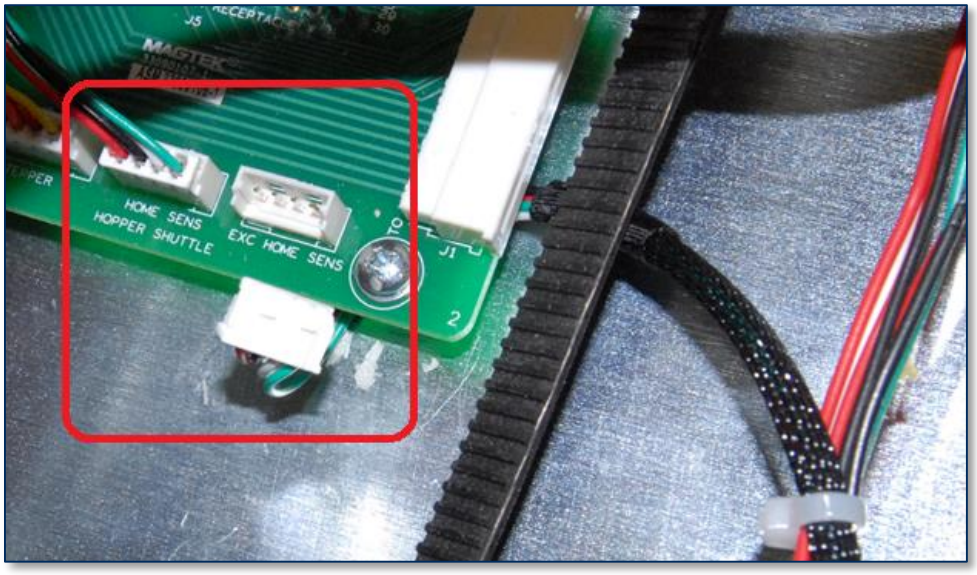


Figure 4-33 – Hopper Module Breakout Board (TOP VIEW FROM FRONT)

10) Trace the hopper module's flex cable to where it plugs in to the hopper transport (see **Figure 4-34**).

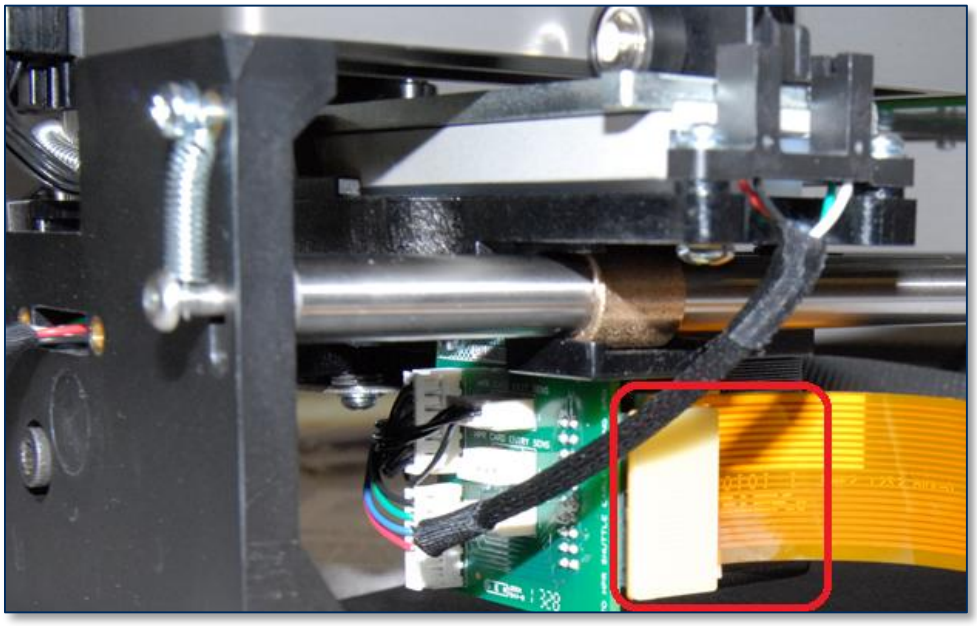


Figure 4-34 - Hopper Transport Flex Cable Connection (FRONT RIGHT VIEW)

11) Disconnect the flex cable from the hopper transport, and carefully pull it free from the small pad of double-sided foam tape just next to the plug (see **Figure 4-35**).

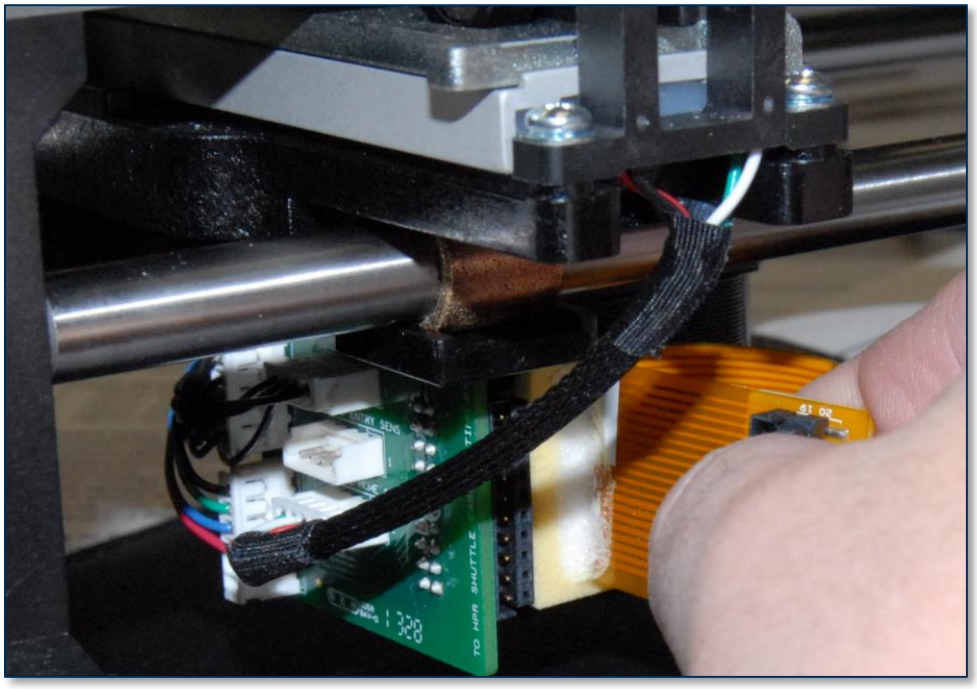


Figure 4-35 - Disconnecting the Hopper Transport Flex Cable

12) Use the 5/32 in. ball end Allen wrench to remove the four screws that secure the four corners of the hopper module to the top deck plate. Some screws require inserting the Allen wrench through openings in the hopper deck plate. See **Figure 4-30** and **Figure 4-36** for reference.

Figure 4-36 –3 of 4 Hopper Module Screws (TOP RIGHT VIEW)

13) Locate the hopper transport belt. It will remain attached to the hopper transport during removal.

14) Release the tension on the hopper transport belt by using the 5/32” Allen wrench to loosen the belt tension screw on the front of the hopper module (see **Figure 4-37**).

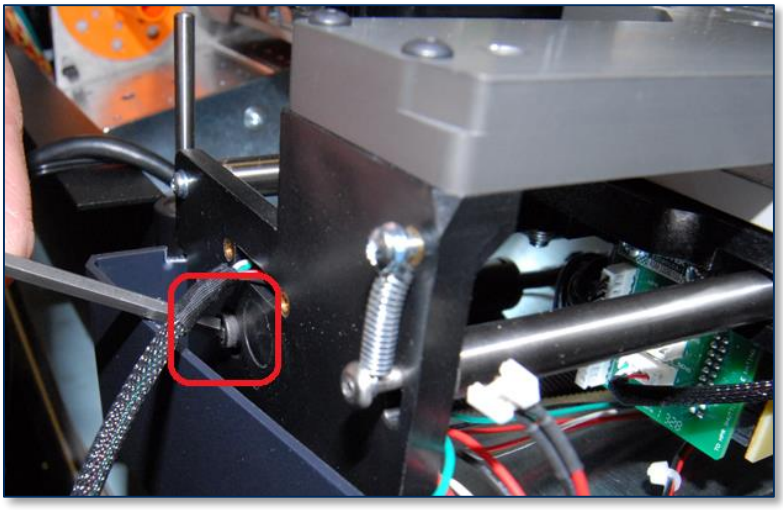


Figure 4-37 - Hopper Transport Belt Tension Adjustment Screw (FRONT RIGHT VIEW)

15) Carefully slip the hopper transport belt off the gear of the motor mounted to the top deck plate, near the rear of the hopper module (see **Figure 4-38**).

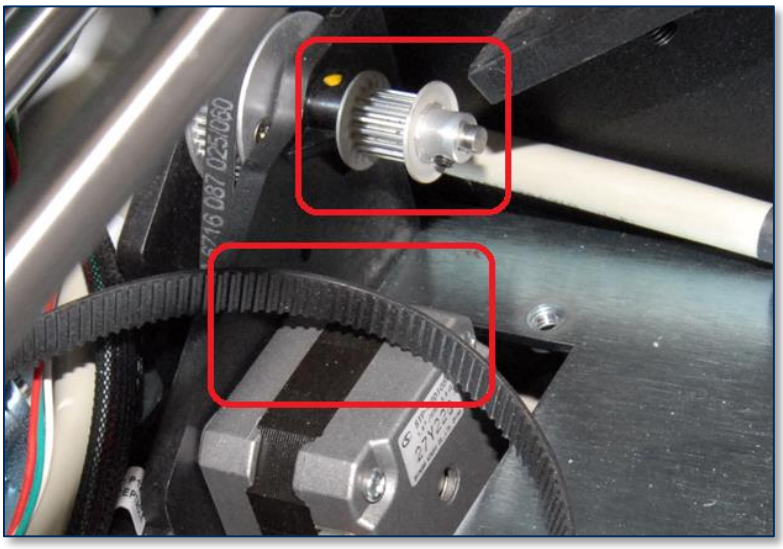


Figure 4-38 - Hopper Transport Belt and Drive Motor (FRONT RIGHT VIEW)

16) Use both hands to carefully lift the hopper module out of the device, making sure no cables are snagged on the hopper module or the device, and set it aside.

To re-install the hopper module, follow these steps:

1) Note that if any cables or cable ties are too difficult to reach during the following steps, you can remove the hopper deck (the steel plate on the top of the hopper module); use the 5/64" Allen wrench to remove the five screws that secure it to the hopper module, and set the screws and deck aside.
2) On the replacement hopper module, move the hopper transport to hopper 4 (see section **2.8 How to Safely Move Transports By Hand**).
3) Using both hands, carefully insert the rear side of the hopper module into the device at a slight angle, and rest it on the top deck plate so its screw holes line up with the corresponding holes in the top deck. Make sure it doesn't pinch any cables or the drive belt. See **Figure 4-39**.

Figure 4-39 - Re-installing Rear Side of Hopper Module First (TOP FRONT VIEW)

4) Carefully lower the front side of the hopper module into the device so its holes line up with the corresponding holes in the top deck plate. Make sure it doesn't pinch any cables or the drive belt. See **Figure 4-40**.

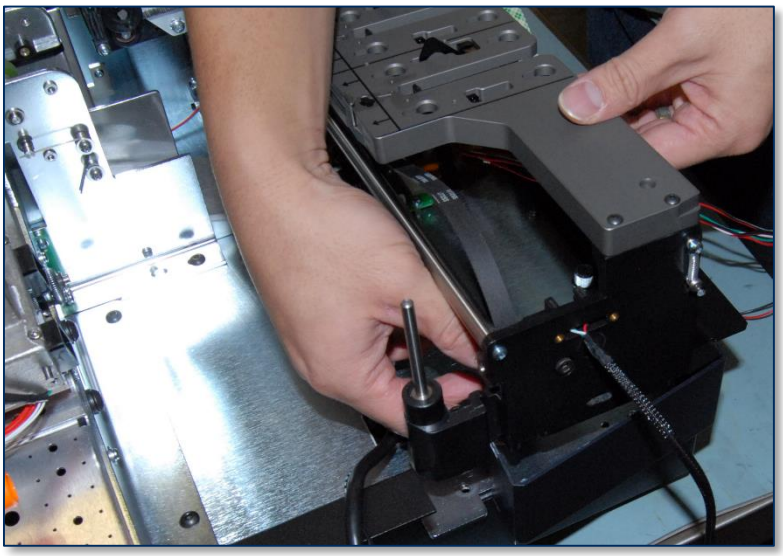
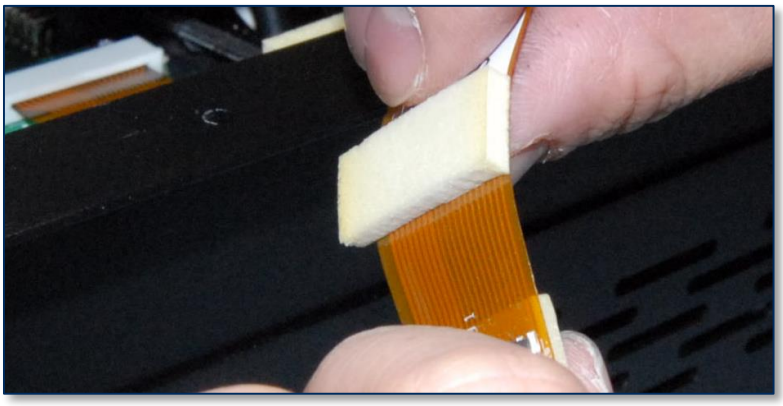


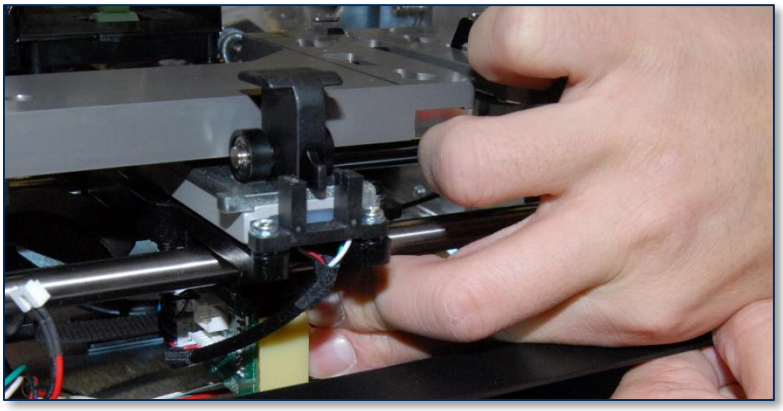
Figure 4-40 - Re-installing Rear Side of Hopper Module First (TOP FRONT VIEW)

5) Pull any loose cables toward the outside of the device to make them easy to find, and to clear them out of the way.

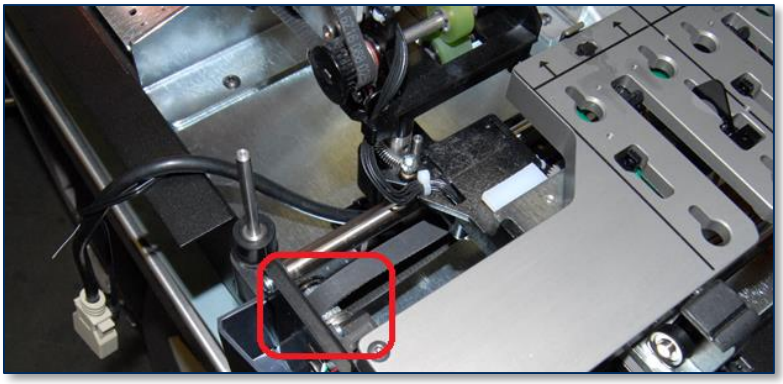
6) Move the hopper transport to the front of the device, just past hopper 7 and before it rotates to the manual feed slot (see **Figure 4-31** and section **2.8 How to Safely Move Transports By Hand**).
7) Stick ¼" of double-stick tape to the hopper transport flex cable just behind the plug.



8) Plug the flex cable into the hopper transport so it points toward the rear of the device, and stick the double-stick tape to the hopper transport's motor as shown.



9) Make sure the hopper transport belt is looped around the drive gear at the front of the hopper transport module as shown.



10) Route the EXC HOME SENS cable from the front of the hopper module to the right of the device, around the hopper mounting legs, then toward the rear of the device as shown in **Figure 4-41**.

11) Loop a cable tie through the anchor point on the top deck plate near the front of the device, tie the EXC HOME SENS cable to the other cables, and tighten and trim the cable tie (see **Figure 4-41**).

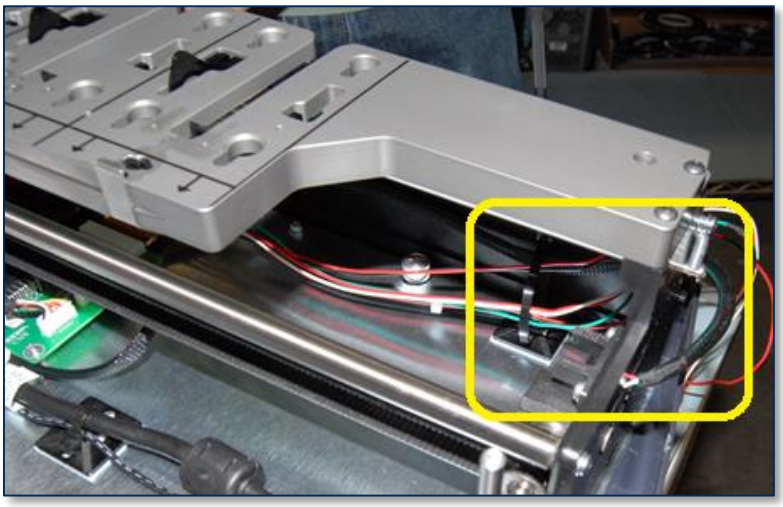


Figure 4-41 - EXC HOME SENS Cable Routing (TOP LEFT VIEW)

12) Continue routing the EXC HOME SENS cable along the right side of the device and thread it under the right side of the HOPPER SHUTTLE board, then out the front as shown in **Figure 4-42**.

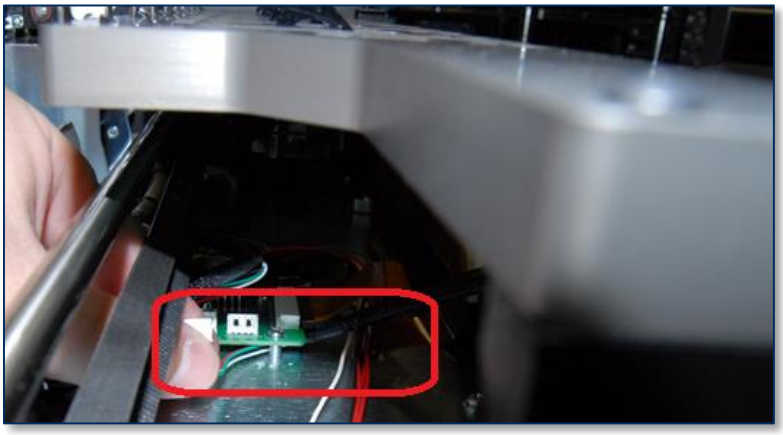


Figure 4-42 - Routing the EXC HOME SENSOR Cable (FRONT VIEW)

13) Use a miniature cable tie to fasten the EXC HOME SENS cable near the front of the device, securing it to the bundle of cables that runs along the right side of the device (see **Figure 4-43**).

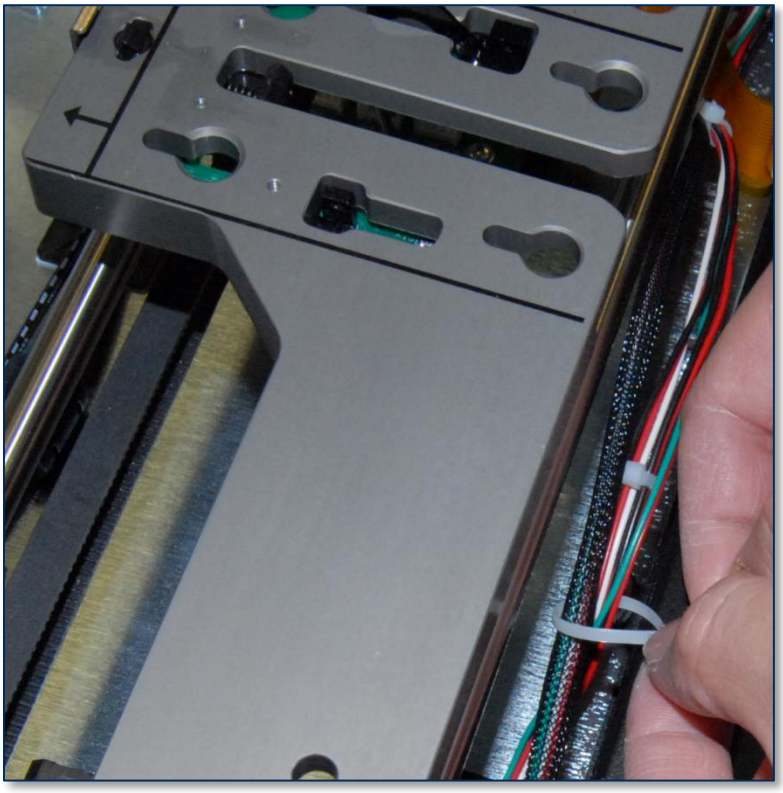
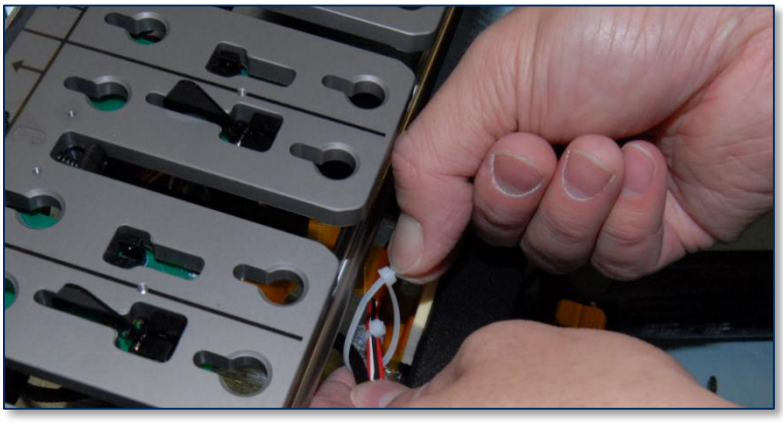


Figure 4-43 - Securing the EXC HOME SENS Cable (TOP VIEW FROM FRONT)

14) Use a miniature cable tie to fasten the EXC HOME SENS cable to the same bundle of cables, near the flex cable as shown.



15) Locate the HOME SENS cable that comes from the rear of the hopper module. Route it along the rear wall of the device to the left side of the hopper module, and below the shielding around the image printer as shown in Figure 4-44. If there is not enough slack in the cable, use the 5/32" Allen wrench to seat the cable below the axle of the hopper motor's gear as shown in Figure 4-45.

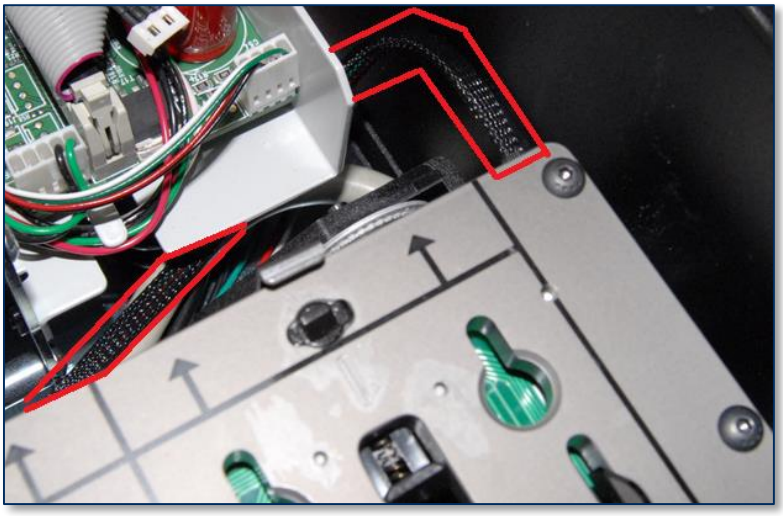


Figure 4-44 - Preferred Routing for HOME SENS Cable (TOP VIEW FROM FRONT RIGHT)

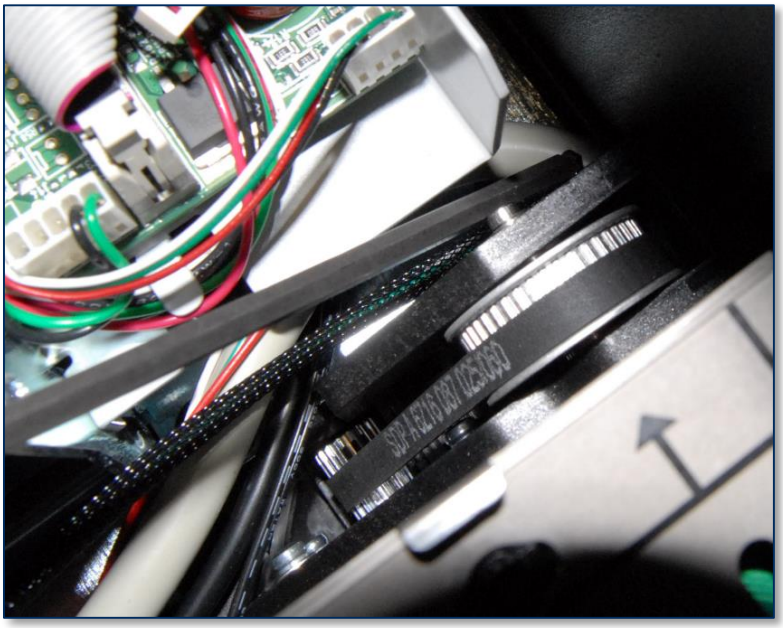


Figure 4-45 – Optional Routing for Tighter HOME SENS Cable (TOP VIEW FROM FRONT RIGHT)

16) Continue routing the HOME SENS cable along the bundle of cables that runs below the left edge of the hopper module. Use cable ties to re-bundle the cables as shown in **Figure 4-46**.

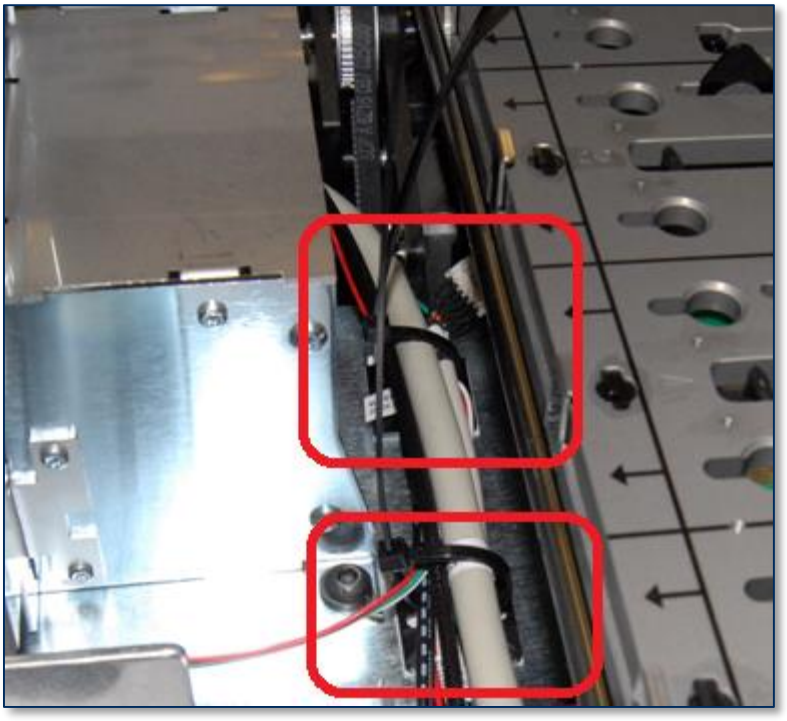


Figure 4-46 - Routing the HOME SENS Cable (TOP FRONT VIEW)

17) Continue routing the HOME SENS cable under the clip just to the left of the HOPPER SHUTTLE circuit board as shown in **Figure 4-47**.

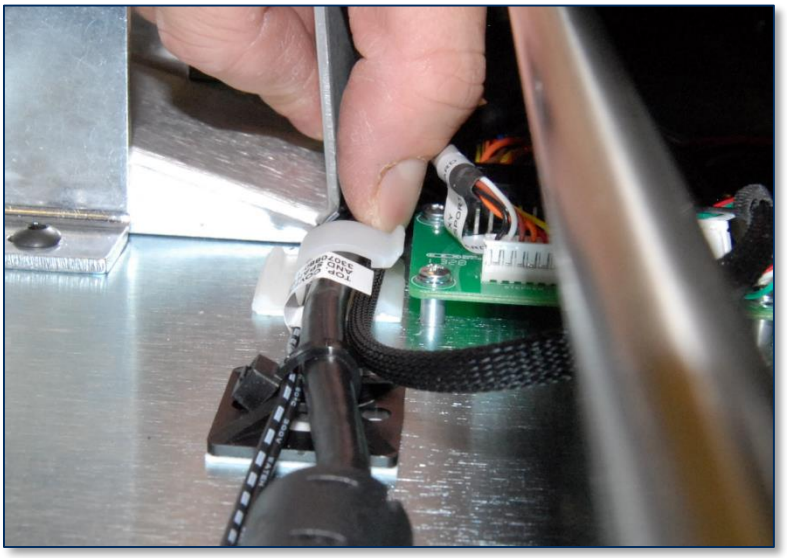


Figure 4-47 - Routing the HOME SENS Cable (FRONT VIEW)

18) Plug the two sensor cables into the HOPPER SHUTTLE circuit board (see **Figure 4-48**).
    a) The HOME SENS cable from the rear of the hopper module plugs into the left connector, labeled HOME SENS.
    b) The EXC HOME SENS cable from the front of the hopper module plugs into the right connector, labeled EXC HOME SENS.

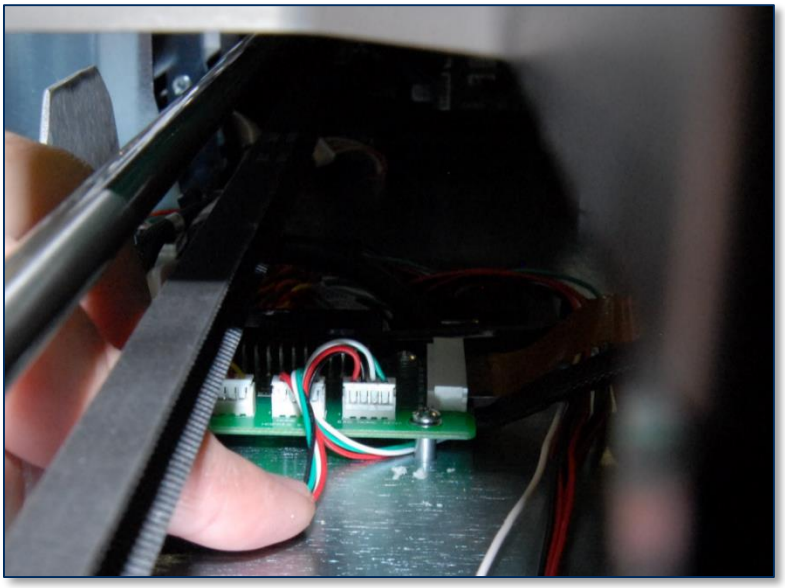


Figure 4-48 - Sensor Cables Plugged In To HOPPER SHUTTLE Circuit Board (FRONT VIEW)

19) Plug the two sensor cables at the rear of the device into the two plugs on the circuit board at the top rear right of the hopper module. The cable labeled "…to J2…" goes to the REAR plug, and the cable labeled "…to J1…" goes to the FRONT plug. See **Figure 4-49**.

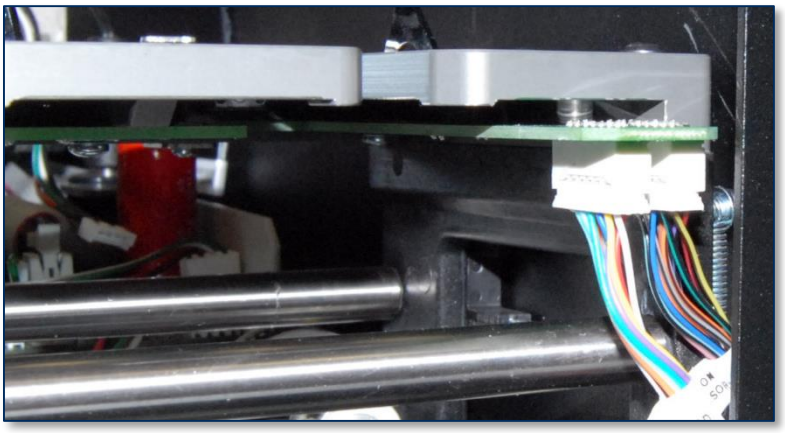


Figure 4-49 - Sensor Cables at Rear of Hopper Module (RIGHT VIEW)

20) Loop the hopper transport drive belt around the gear of the hopper drive motor at the rear of the device as shown in **Figure 4-50**.

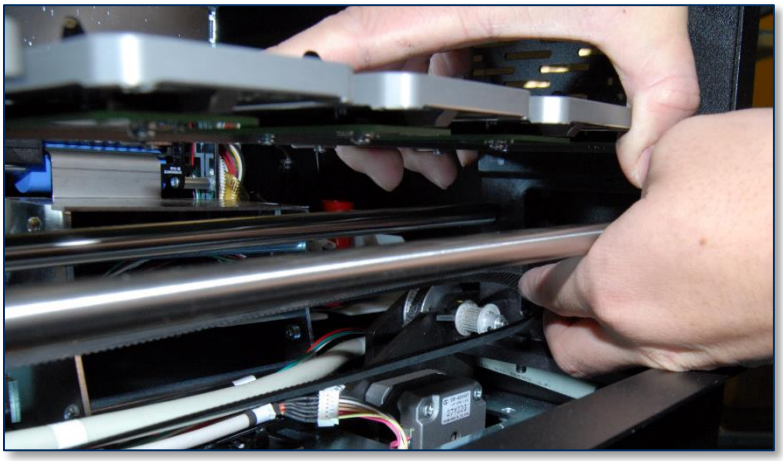


Figure 4-50 - Attaching Hopper Transport Drive Belt (FRONT RIGHT VIEW)

21) Use the 5/32" Allen wrench to insert and tighten the four screws that secure the hopper module to the top deck plate (see **Figure 4-30** at the beginning of this section).
22) Use the 5/32" Allen wrench to tighten the belt tensioner screw on the front of the hopper module (see **Figure 4-37**) so the top and bottom of the drive belt are parallel with each other and the belt feels tight to your fingers. During testing, the belt should not slip or make grinding sounds. If it does, the tension may need to be re-adjusted.
23) Test the new hopper module manually by moving the hopper transport along the full range from front to back (see section **2.8 How to Safely Move Transports By Hand**). Make sure it does not touch any cables or other parts along its entire path, that the drive motor at the rear of the device moves along with it, and that it does not make any unusual sounds, such as clicking, rubbing, or grinding.
24) Perform any additional service that requires the device to be powered off and open.
25) Re-install the cover and top access door by following the steps in sections **4.4** and **4.2** respectively.
26) Move the hopper transport to the front of the device, just past hopper 7 and before it rotates to the manual feed slot (see **Figure 4-31** and section **2.8 How to Safely Move Transports By Hand**).
27) Re-install the card stock hoppers.
28) Close the top access door.
29) Re-attach the power cable, network cable, and any security hardware.
30) Power up the device.
31) Perform any relevant adjustments from section **5 Adjustments**, notably section **5.2 How to Calibrate the Hopper Transport Module**.
32) From the touchscreen, navigate to **Menu** > **Samples**, create a sample card, and make sure the device functions properly and the sample looks correct.

4.6 How to Remove / Re-install the Image Print Head

For detailed instructions to replace the image print head, see ***99875600 EC2000 User Installation and Operation Manual***.

4.7 How to Remove / Re-install the Image Printer Module

Approximate time to remove: 15 minutes plus any sub-procedures Approximate time to re-install: 15 minutes plus any sub-procedures

The image printer, located in the rear center of the device, takes blank card stock from the hopper transport, encodes any required data onto the card, produces images on both sides, and ejects the card out the other side to be retrieved by the XY transport.

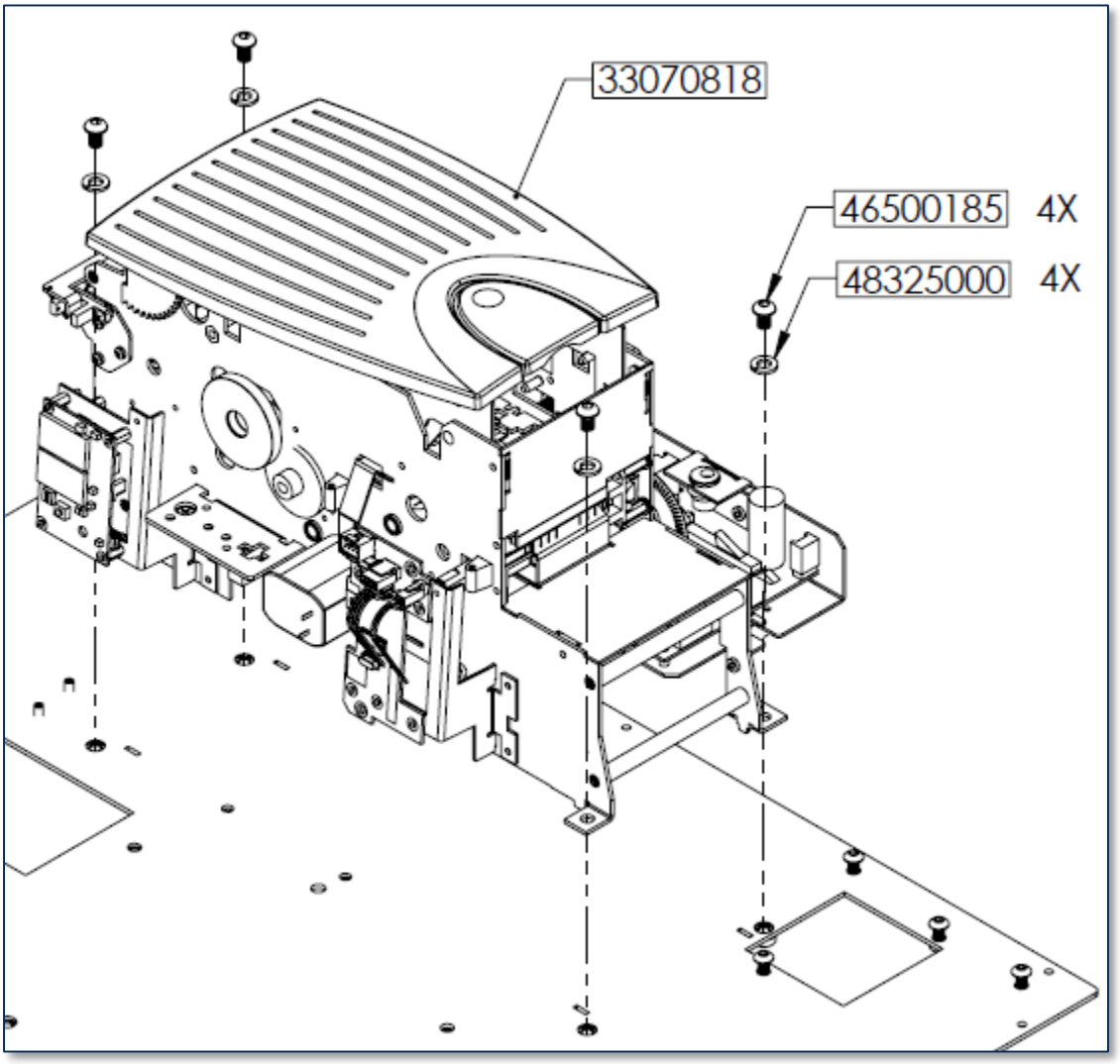


Figure 4-51 - Removing / Re-installing the Image Printer (FRONT RIGHT VIEW)

Follow these steps to remove the image printer module:

1) If you are replacing any modules that do NOT require silicone adhesive, replace those first. That will reduce the risk of breaking the image printer power connector's adhesive during other service.
2) Prepare the device for replacing parts by following the steps in section **4.1 How to Prepare the Device for Removing / Re-installing Modules**. At the end, the device should be powered down with all external cables safely disconnected.

3) Disengage and lean back the top access door by following the steps in section **4.2 How to Remove / Re-install the Top Access Door** up to the point where the top access door is leaning up and back behind the device (**Figure 4-3**).
4) Remove the image printer ribbon and set it aside in a secure location or give it to the customer for temporary storage or secure disposal.
5) Move the hopper transport away from the image printer, toward the front of the device (see section **2.8 How to Safely Move Transports By Hand**).
6) On the rear right side of the image printer, locate the power cable shown in **Figure 4-52.** Remove any adhesive securing it to its connector, and disconnect it.

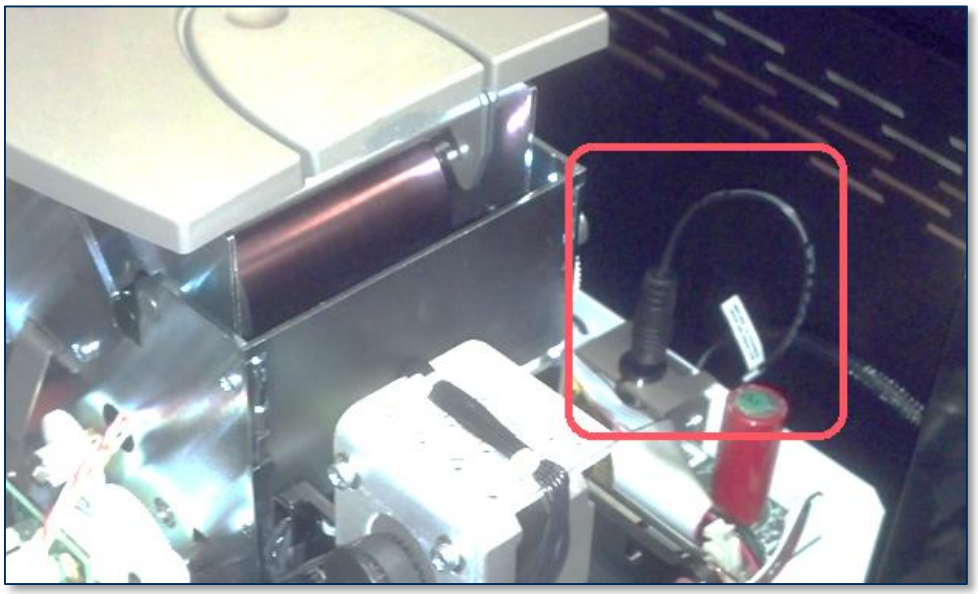


Figure 4-52 - Image Printer Power Connector (FRONT RIGHT VIEW)

7) From the power connector, look left across the rear wall of the EC2000, past a motor, to a circuit board with several white connectors. Find connector **J31** on the circuit board, and unplug the black insulated cable from it (see **Figure 4-53** and **Figure 4-56**). This is the image printer USB cable.

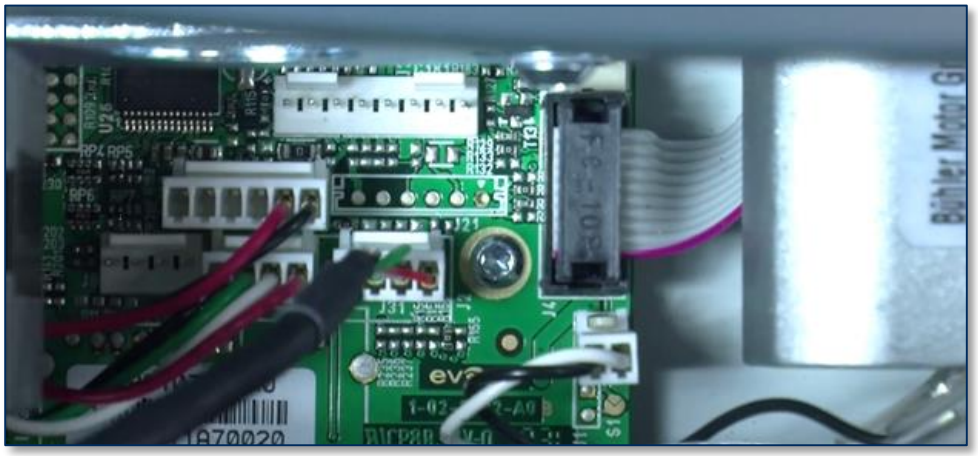


Figure 4-53 - Image Printer USB Cable Connected to J31 (TOP VIEW FROM REAR)

8) Near the front left screw of the image printer, locate the cable labeled **Y END SENSOR**, shown in Figure **4-54**, and disconnect it.

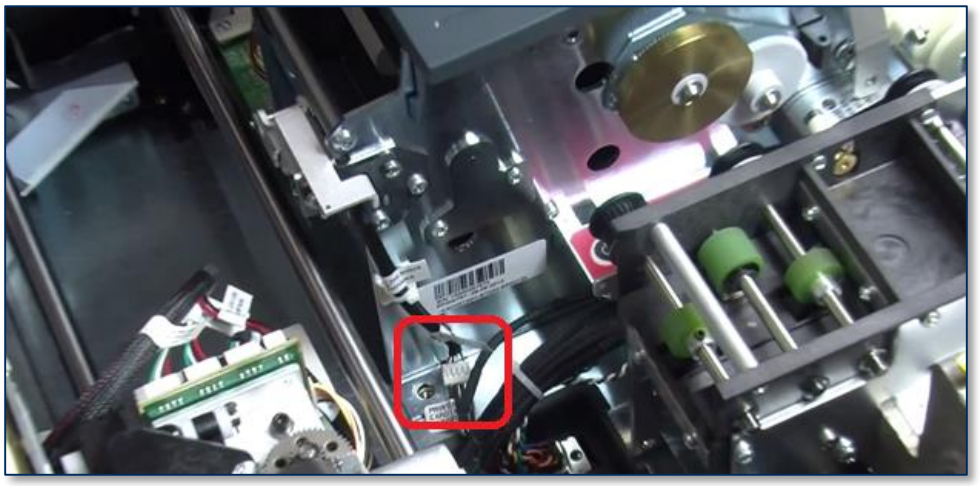
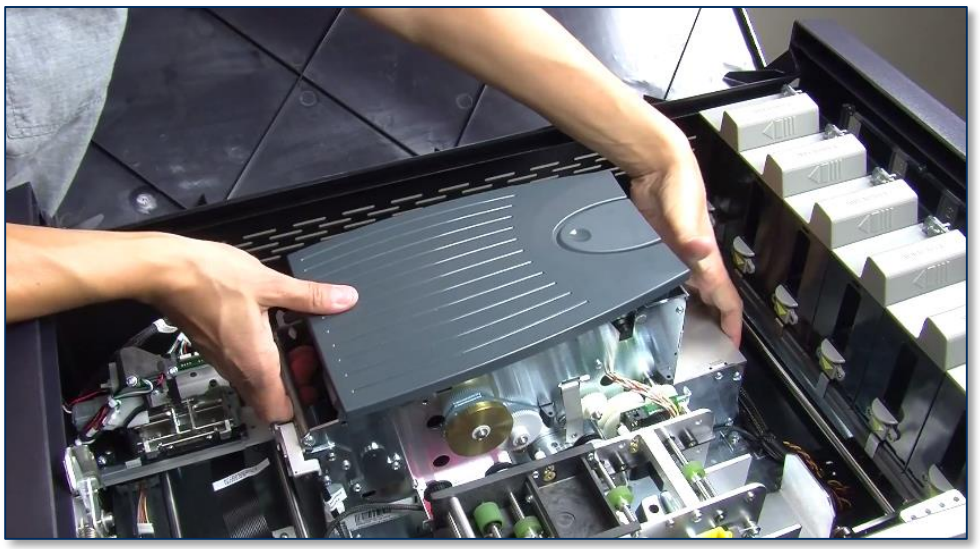


Figure 4-54 - Image Printer Exit Sensor Connector (TOP LEFT VIEW)

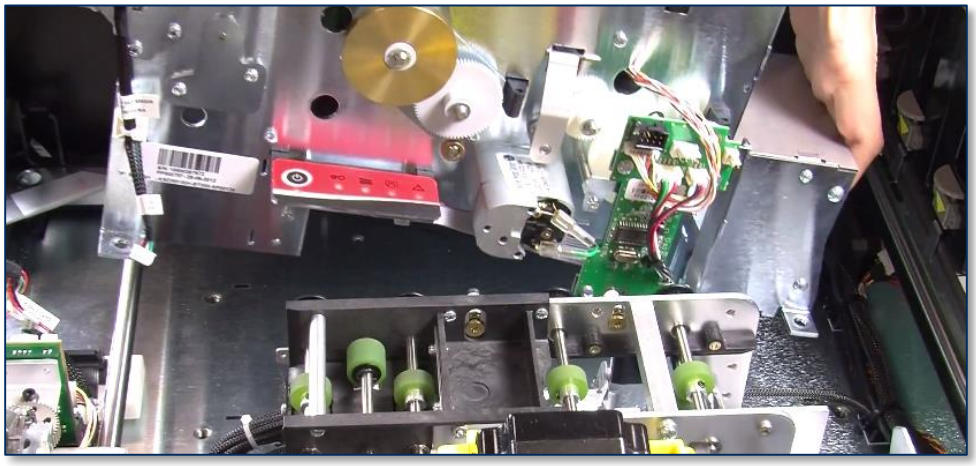
9) Use the 5/32” Allen wrench to unscrew the four screws and washers that attach the four corners of the image printer to the top deck plate (see **Figure 4-51**).

10) Use both hands to carefully lift the printer out of the device, making sure no cables catch on it as you remove it. Set it aside.



To re-install the image printer module, follow these steps:

1) Clear all cables out of the way to make room on the top deck plate for the replacement image printer.
2) Carefully lower the replacement image printer, tilted slightly downward toward the hoppers, and line up the screw holes in its base with the screw holes in the top deck plate.



3) Make sure the downward-facing sheet metal tabs in the base of the image printer insert into the corresponding slots on the top deck plate (see **Figure 4-55**). You may have to push a bit on the sheet metal of the image printer's base to line up the tabs.

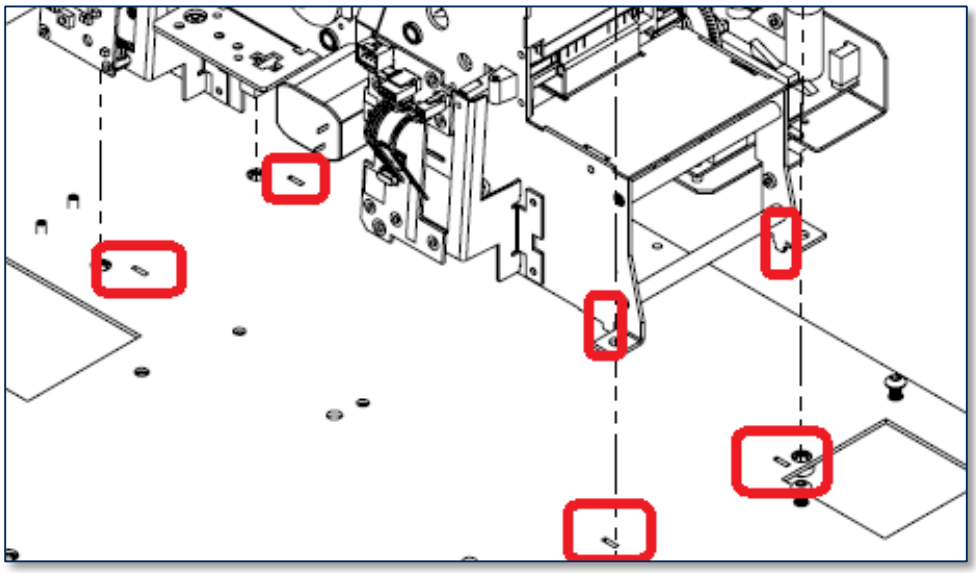


Figure 4-55 - Seat Image Printer Tabs In Slots (TOP RIGHT VIEW)

4) Use the 5/32" Allen wrench to re-fasten the screws and washers that secure the image printer to the top deck plate (see **Figure 4-51**).
5) Re-connect the power cable, reconnect the card exit sensor, and reconnect the USB cable to **J31**.

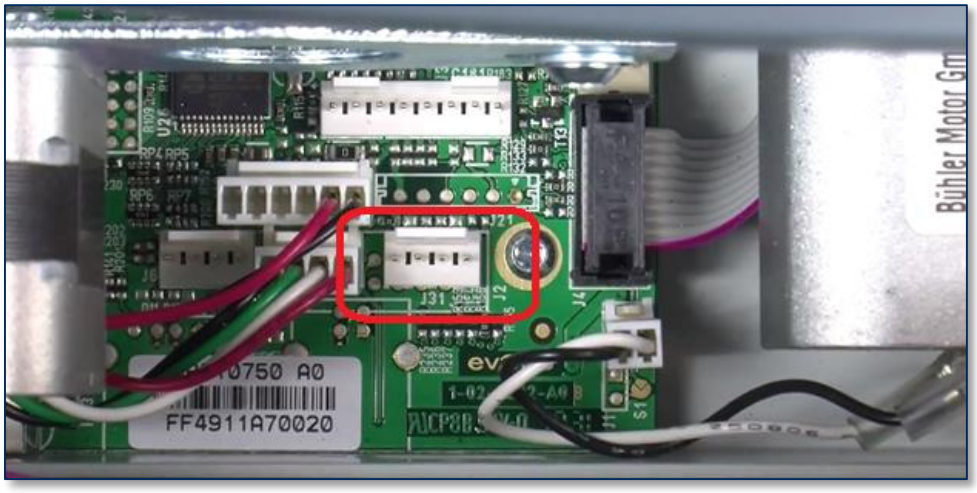


Figure 4-56 - Re-connect USB Cable to J31 (TOP VIEW FROM REAR)

6) Secure the power cable to its connector using a bead of silicone adhesive as shown in **Figure 4-57**.

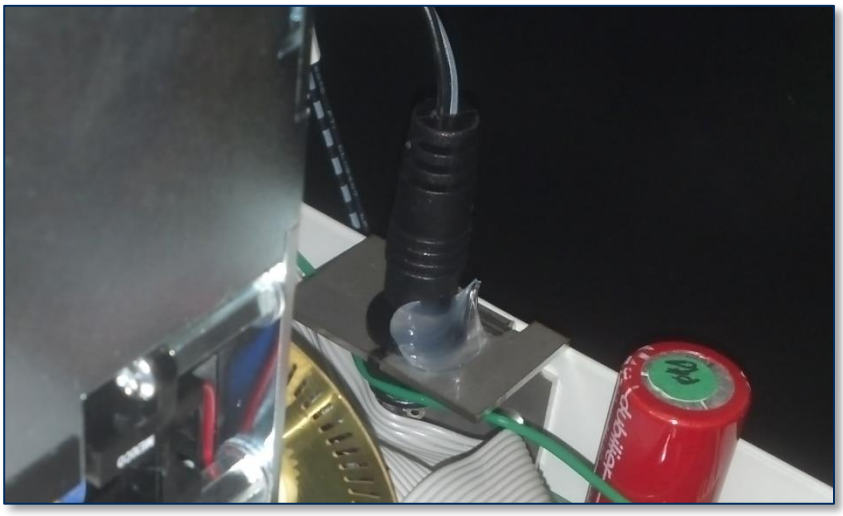


Figure 4-57 - Silicone Adhesive On Image Printer Power Connector (FRONT RIGHT VIEW)

7) Re-attach the top access door by reversing the steps you used to lean it back.
8) Install the original printer ribbon, or obtain and install a new image printer ribbon from the customer.
9) Re-connect the power and network cables to the device and power it up.
10) Configure the image printer ribbon following the steps provided in ***99875600 ExpressCard 2000 User Installation and Operation Manual***.
11) Perform any relevant adjustments from section **5 Adjustments**, notably section **5.6 How to Calibrate the Image Printer**.
12) Close and secure the top access door.
13) From the touchscreen, navigate to **Menu** > **Samples**, create a sample card, and make sure the device functions properly and the sample looks correct.

4.8 How to Remove / Re-install the XY Transport Ribbon Cable

This section provides information for replacing just the XY transport ribbon cable, which occasionally must be replaced without replacing the entire module. For instructions on removing and re-installing the entire XY transport module, see section **4.9 How to Remove / Re-install the XY Transport**.

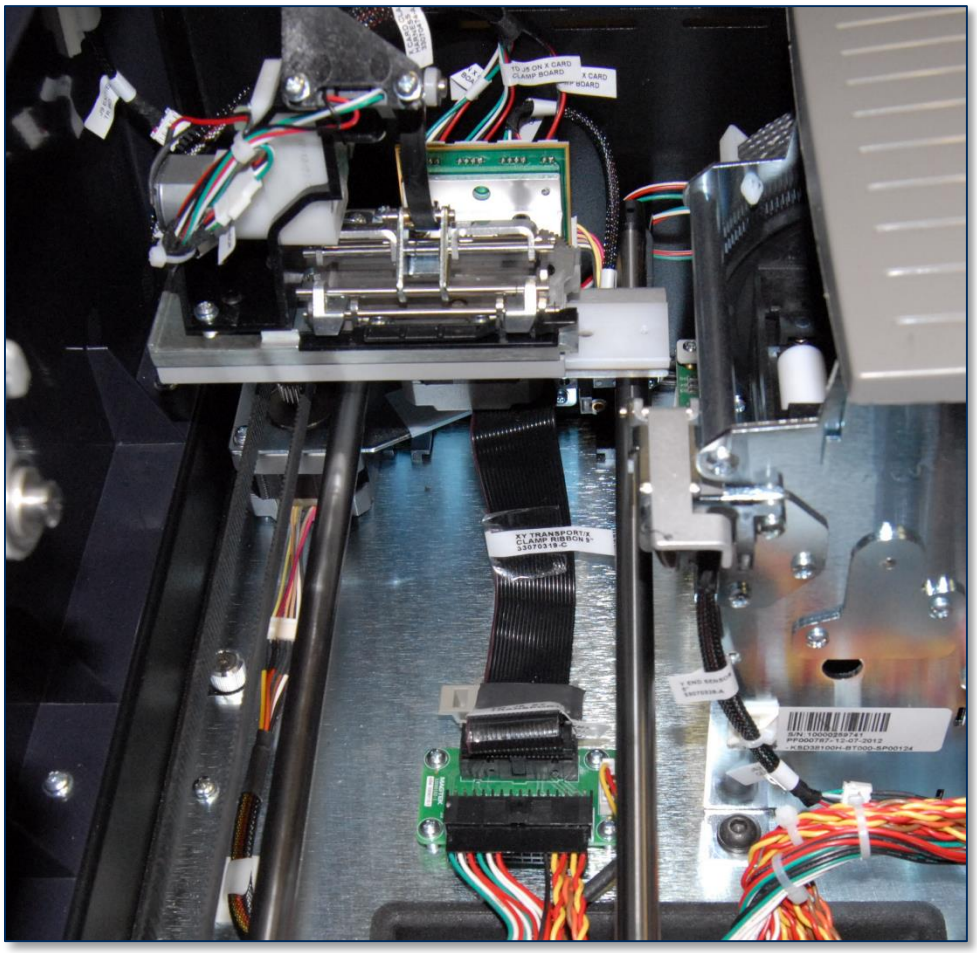


Figure 4-58 - XY Transport Showing Ribbon Cable (FRONT VIEW)

To remove the XY transport module's ribbon cable, follow these steps:

1) Prepare the device for replacing parts by following the steps in section **4.1 How to Prepare the Device for Removing / Re-installing Modules**. At the end, the device should be powered down with all external cables safely disconnected.
2) Open the top access door by following the steps in section **2.7 How to Open the Top Access Door**.
3) Move the XY transport to the front of the device to expose its cable and its connection to the circuit board ("breakout board") on the base plate of the device (see **Figure 4-59** and section **2.8 How to Safely Move Transports By Hand**).

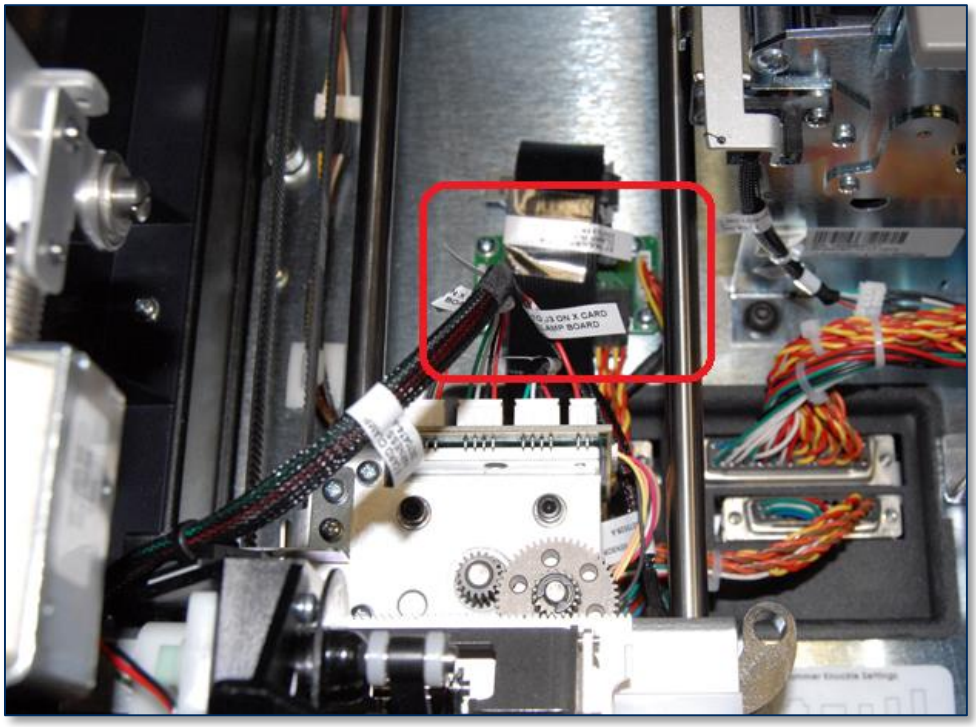


Figure 4-59 - XY Transport at Front of Device Exposing Breakout Board (TOP VIEW)

4) On the rear side of the XY transport, locate the two retaining clips that secure the ribbon cable to the transport. Lift both clips firmly toward the ceiling to unlock and eject the cable from the circuit board, then disconnect the ribbon cable. See **Figure 4-60**.

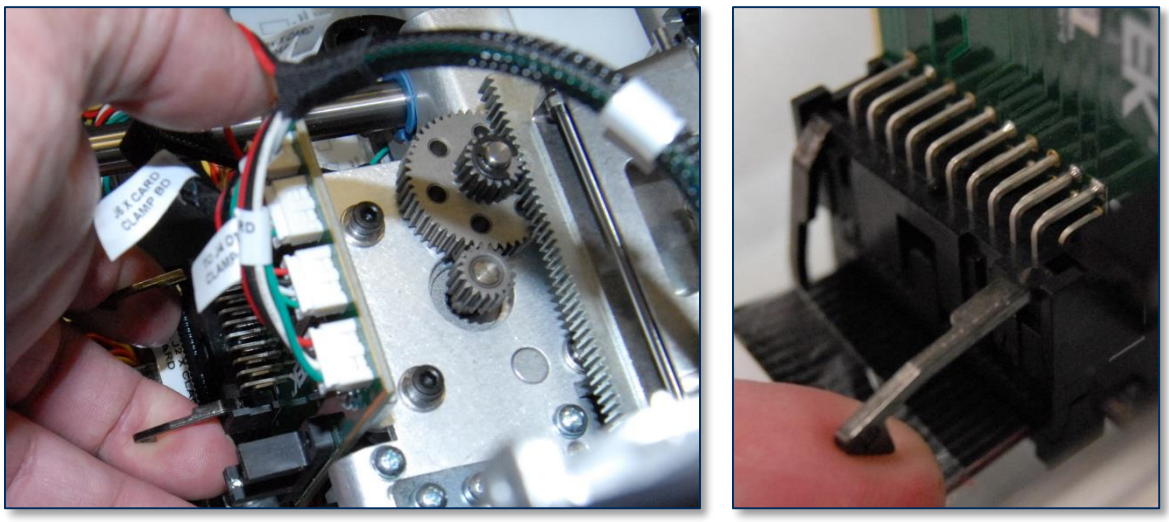
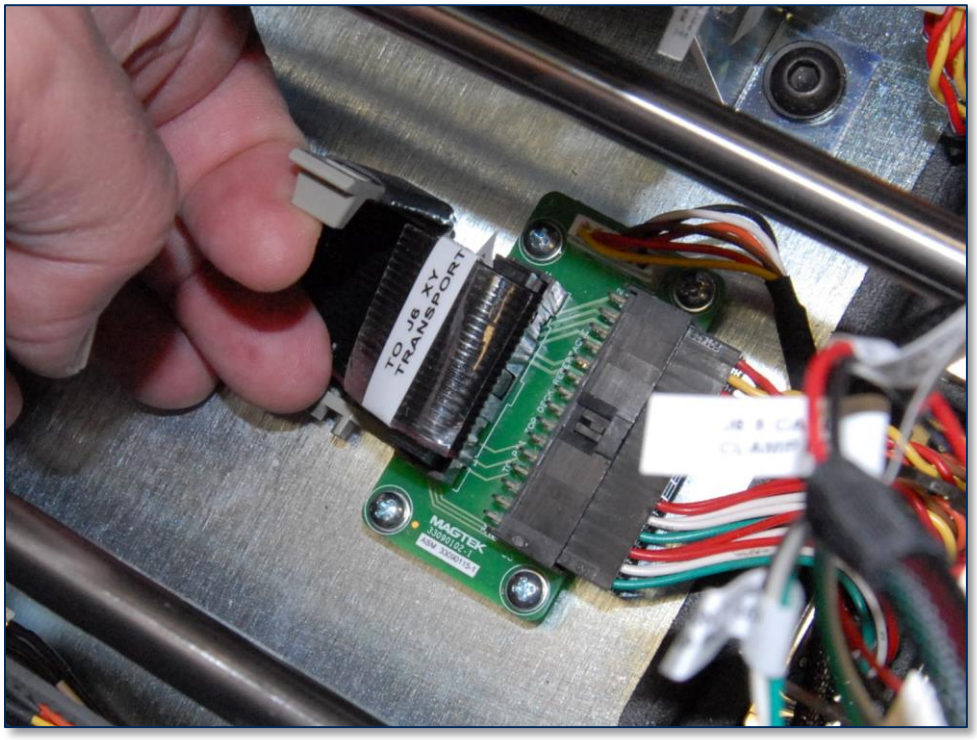


Figure 4-60 - Unlocking XY Transport Ribbon Cable (TOP VIEW FROM LEFT / REAR LEFT VIEW)

5) Open the clip that secures the ribbon cable to the top deck plate.



6) Disconnect the ribbon cable from the breakout board on the top deck plate, and set the cable aside.
7) If there is adhesive on any of the connectors, peel or gently scrape it off and discard it.

To re-install the XY transport ribbon cable, follow these steps:

1) Locate the end of the cable labeled **TO J6 XY TRANSPORT BOARD** and connect it to the breakout board on the top deck plate, with the cable coming off the board toward the **front** of the device. Press down to make sure the connection is solid.

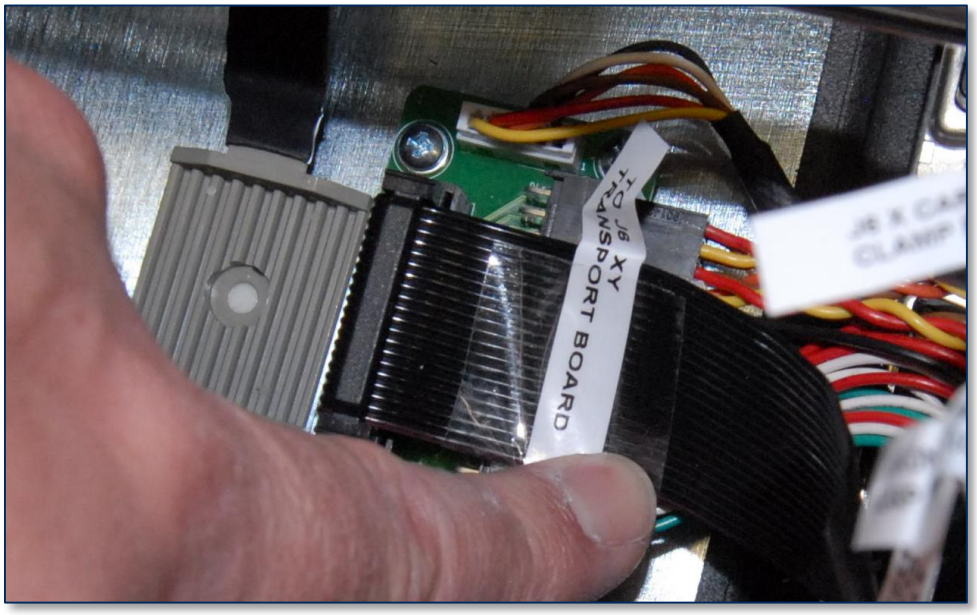


Figure 4-61 - Breakout Board Connection of XY Transport Ribbon Cable (TOP VIEW FROM LEFT)

2) Route the cable through the clip that secures it to the top deck plate, close the clip, and press down until you feel it click in place (see **Figure 4-62**).

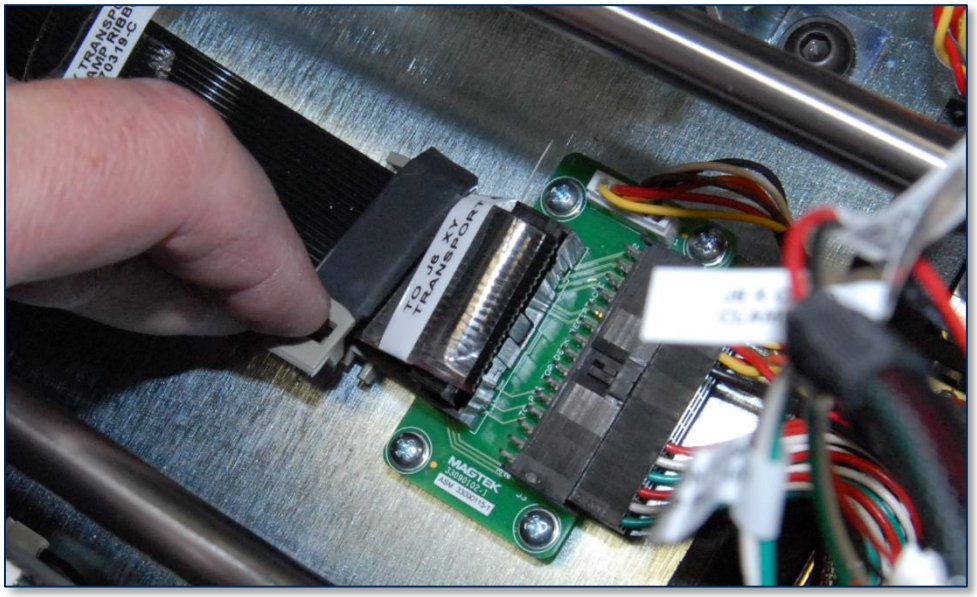


Figure 4-62 - Locking XY Transport Ribbon Cable In Place (TOP VIEW FROM LEFT)

3) Make sure the loose end of the cable says **TO J2 X CLAMP BOARD** and is oriented as shown in **Figure 4-63**.

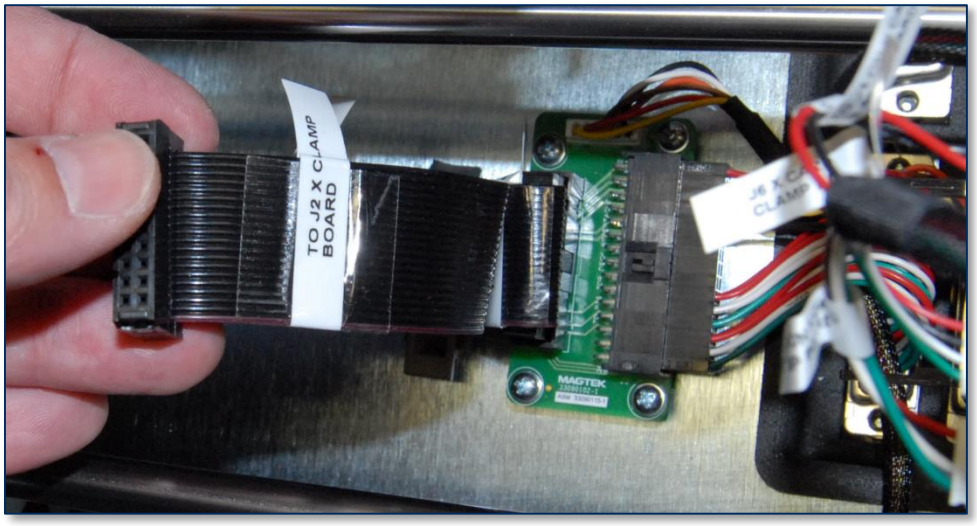


Figure 4-63 - XY Transport End of Ribbon Cable (TOP VIEW FROM LEFT)

4) Connect the cable to the XY transport as shown in **Figure 4-64**. It should come off the XY transport toward the front of the device before looping back toward the breakout board.

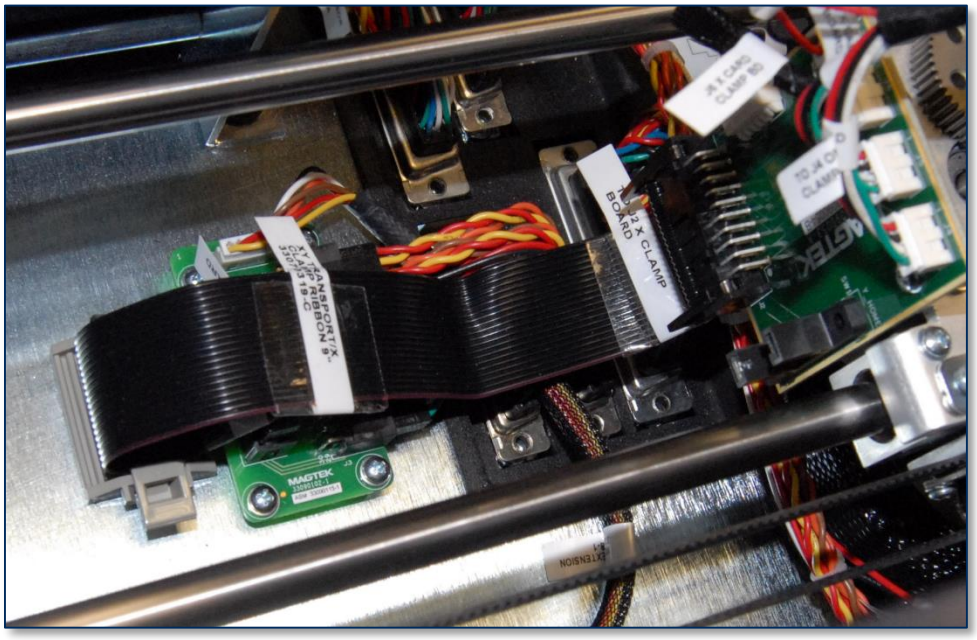
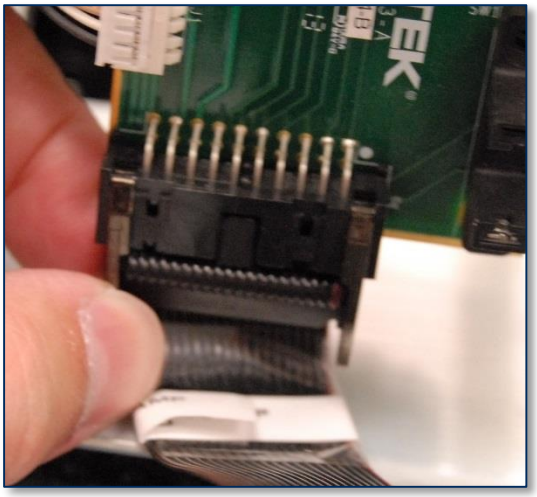


Figure 4-64 - XY Transport Ribbon Cable Installed (TOP VIEW FROM LEFT)

5) Push the retaining clips down toward the printed circuit board and pinch to lock them in place.



6) Move the XY transport to the rear of the device (see section **2.8 How to Safely Move Transports By Hand**) and inspect it to make sure it looks like **Figure 4-58**.
7) Use the belt to push the XY Transport back and forth across the full length of the rails to make sure the ribbon cable moves as it should:
   a) The ribbon cable should wind and unwind in a straight line; it should not twist, bend diagonally, or move to the side.
   b) The ribbon cable should not contact any objects in its path.
   c) If the ribbon cable touches other parts or bends incorrectly, re-check its connections and orientation according to the installation steps, then re-test.
8) Complete any other service that requires the device to be powered off and open.
9) Close the top access door.
10) Re-attach the power cable, network cable, and any security hardware.
11) Power up the device.
12) From the touchscreen, navigate to **Menu** > **Samples**, create a sample card, and make sure the device functions properly and the sample looks correct.

4.9 How to Remove / Re-install the XY Transport Module

Approximate time to remove: 15 minutes plus any sub-procedures Approximate time to re-install: 15 minutes plus any sub-procedures

The XY transport receives cards from the image printer module and moves them to the embosser module, then to the exit transport module. It is located along the left side of the device.

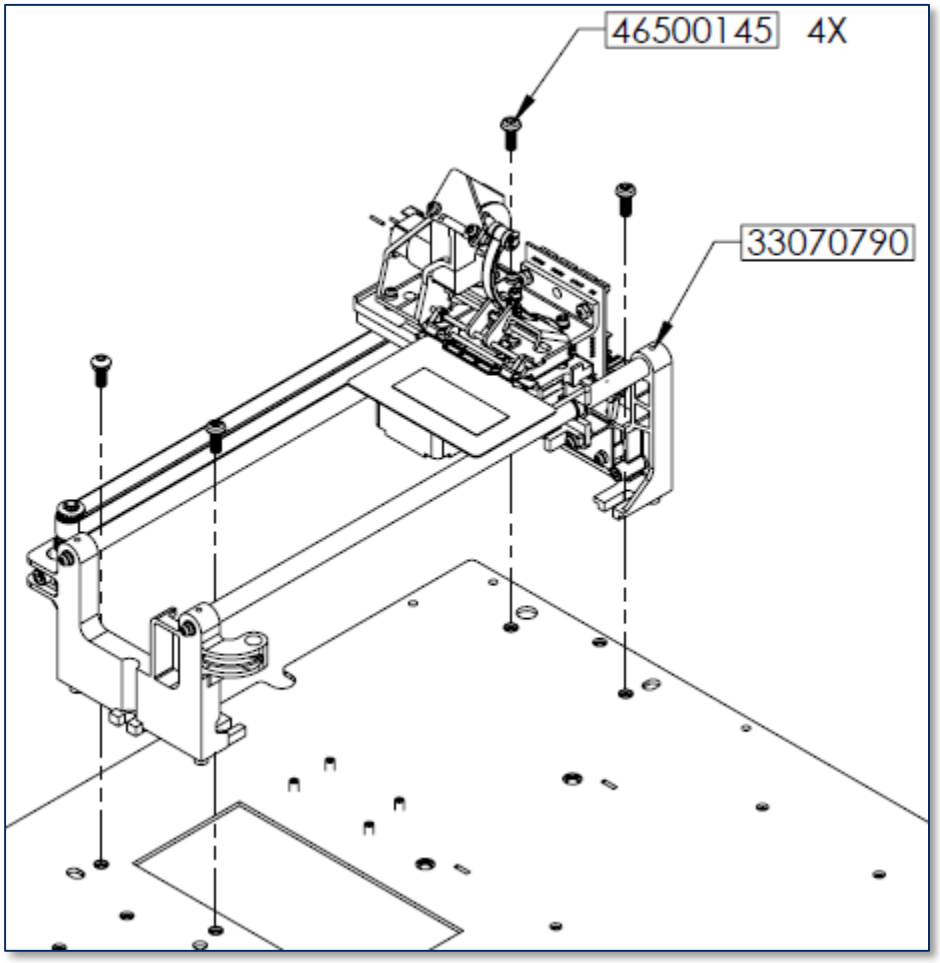


Figure 4-65 - Removing and Re-Installing the XY Transport Module (FRONT RIGHT VIEW)

Follow these steps to remove the XY transport module from the device:

1) Prepare the device for replacing parts by following the steps in section **4.1 How to Prepare the Device for Removing / Re-installing Modules**. At the end, the device should be powered down with all external cables safely disconnected.
2) Disengage and lean back the top access door by following the steps in section **4.2 How to Remove / Re-install the Top Access Door** up to the point where the top access door is leaning up and back behind the device.
3) Move the XY transport toward the front of the device (see section **2.8 How to Safely Move Transports By Hand**).
4) Locate the XY transport's ground cable, which is connected to the deck plate behind the image printer as shown in **Figure 4-66**.

Figure 4-66 - XY Transport Ground Cable (TOP VIEW FROM REAR)

5) Use the No. 2 Philips screwdriver to remove the screw, and set it aside.
6) Snap open the XY transport ribbon cable clamp between the rails as shown in **Figure 4-67**.

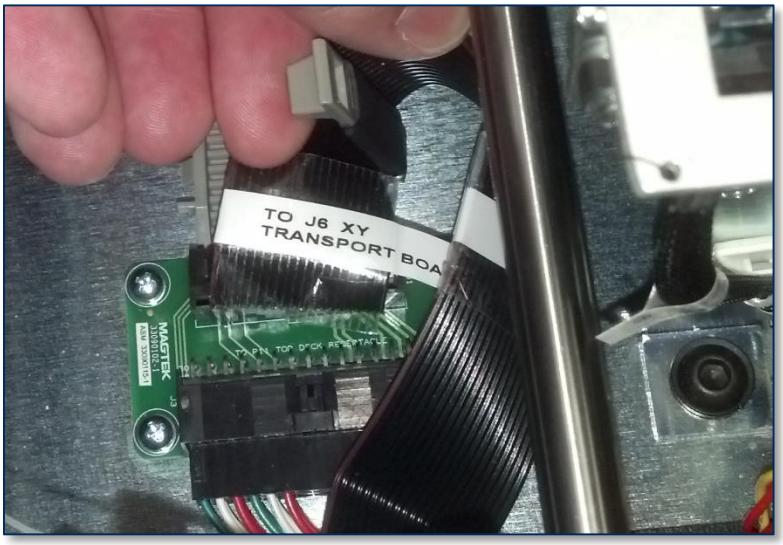


Figure 4-67 - XY Transport Ribbon Cable (TOP VIEW FROM FRONT)

7) Grasping the XY transport ribbon cable by the connector, not the cable itself, disconnect it from the top deck.
8) Locate the connectors in the middle of the Y stepper connection cable, which runs along the left rail of the XY transport (see **Figure 4-68**).
9) Hold the two connectors (not the wires), and disconnect them.

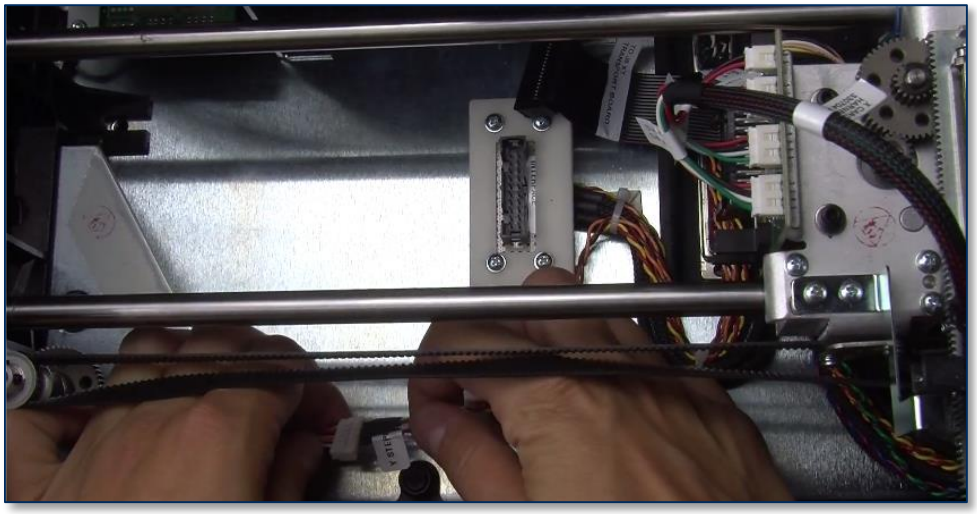
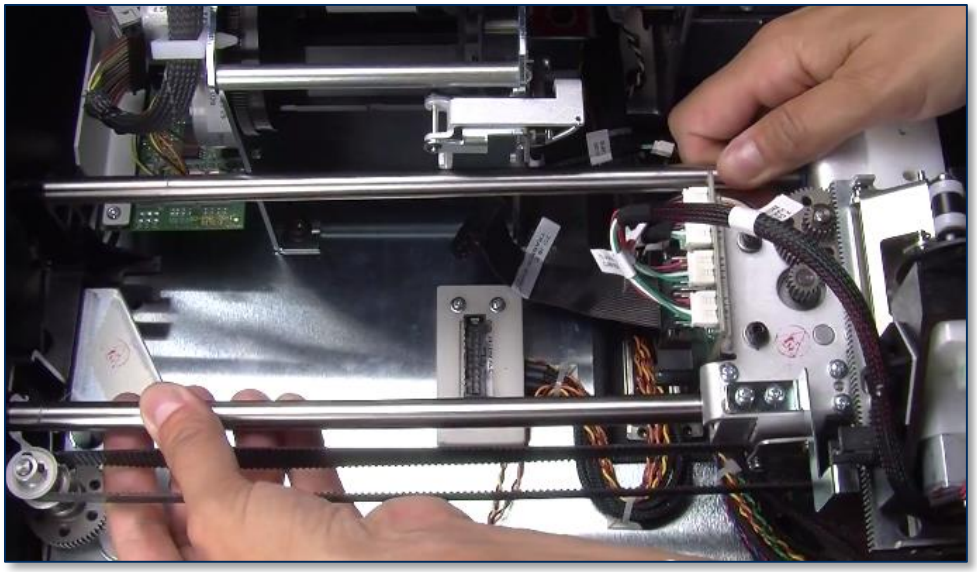


Figure 4-68 - XY Transport Y Stepper Connection Cable (TOP VIEW FROM LEFT)

10) Use the 1/8” Allen wrench to remove the three screws securing the XY transport to the top deck plate near the rear of the device (see **Figure 4-65**) and set them aside.
11) Move the XY transport toward the rear of the device (see section **2.8 How to Safely Move Transports By Hand**).
12) Use the 1/8” Allen wrench to remove the three screws securing the XY transport to the top deck plate near the front of the device (see **Figure 4-65**) and set them aside.
13) Use both hands on the rails to carefully lift the XY transport module out of the device, making sure no cables catch on any other modules, and set it aside.



To re-install the XY transport module, follow these steps:

1) Place the XY transport onto the top deck with the ground cable pointing toward the rear of the device, lining up the holes in the XY transport module with the corresponding holes in the top deck plate.
2) Inspect around and underneath the XY transport to make sure it isn't pressing any cables against the top deck plate or other modules.
3) Make sure the four keys at the corners of the XY transport are seated in the corresponding slots in the top deck plate (see **Figure 4-69**). Push the base of the XY transport forward and backward, left and right, to make sure they prevent it from moving around.

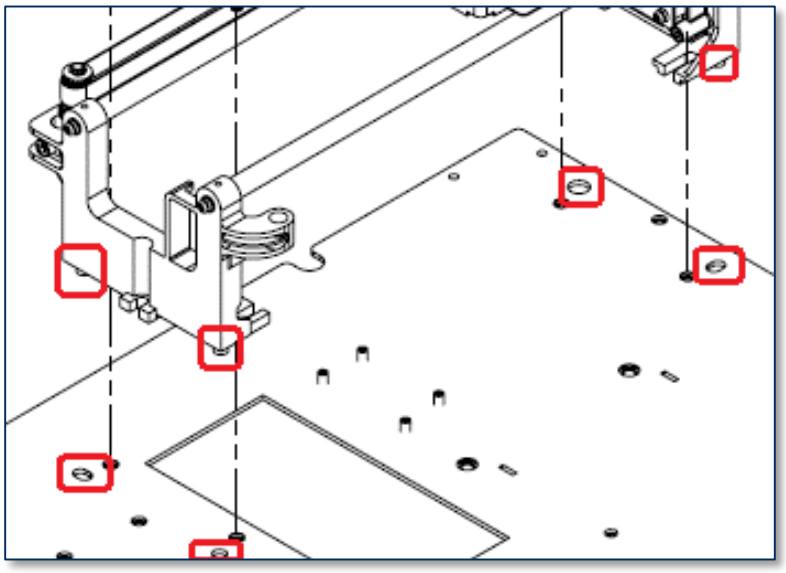


Figure 4-69 - XY Transport Base Keys and Top Deck Plate Holes (TOP RIGHT VIEW)

4) Move the XY transport carriage toward the rear of the device (see section **2.8 How to Safely Move Transports By Hand**).
5) Use the 1/8" Allen wrench to fasten and tighten the three screws securing the XY transport to the top deck plate near the front of the device (see **Figure 4-65**).
6) Move the XY transport carriage toward the front of the device (see section **2.8 How to Safely Move Transports By Hand**).
7) Use the 1/8" Allen wrench to fasten and tighten the three screws securing the XY transport to the top deck plate near the rear of the device (see **Figure 4-65**).
8) Re-connect the Y stepper connection cable (see **Figure 4-68**).
9) Re-connect the XY transport ribbon cable, with the cable coming off toward the front of the device as shown in **Figure 4-67**.
10) Hold the ribbon cable in place in the middle of the clamp. Being careful not to pinch the cable, close the clamp and press until you feel it lock closed.
11) Use the No. 2 Philips screwdriver (and optionally the hemostat pliers) to re-attach the XY transport ground cable to the top deck plate behind the image printer.
12) Re-attach the top access door by reversing the steps you used to lean it back.
13) Calibrate the XY transport using the information in section **5.3 How to Calibrate the XY Transport**.
14) From the touchscreen, navigate to **Menu** > **Samples**, create a sample card, and make sure the device functions properly and the sample looks correct.

15) If the EC2000 does not power up or function properly, contact MagTek Support Services for assistance (see **Appendix A Technical Support**).

4.10 How to Remove / Re-install Embosser Fonts

Under normal circumstances, the characters on the embosser module's daisy wheel do not need to be removed. Embosser characters should be removed and replaced as little as possible, because removal causes the tine to wear and eventually become less effective at holding characters. If a tine breaks, however, it may be necessary to move its character to a new tine.

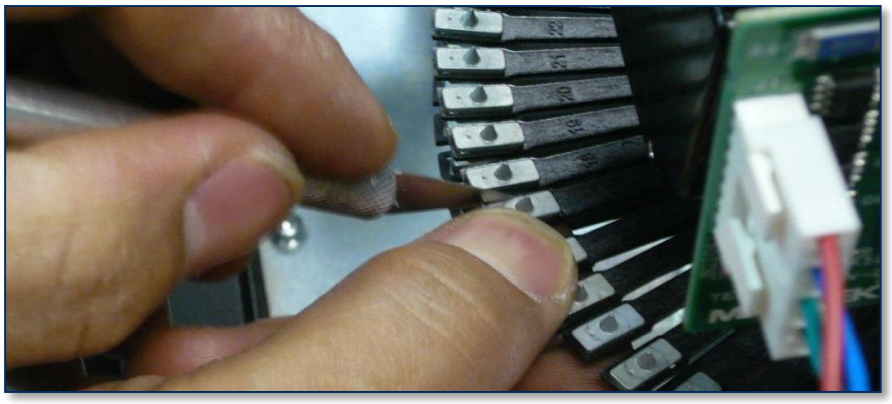


Figure 4-70 - Removing a Character from the Embosser Module Daisy Wheel

To remove a character from a tine on the embosser module's daisy wheel, follow these steps:

1) Prepare the device for replacing parts by following the steps in section **4.1 How to Prepare the Device for Removing / Re-installing Modules**. At the end, the device should be powered down with all external cables safely disconnected.
2) Insert an X-Acto knife between the tine and the character as shown in **Figure 4-70**.
3) Carefully pry the character toward the ceiling until you can remove it with your fingers.
4) Prepare the character for installation in the new time by making sure it is oriented correctly.
5) Support the tine, then press the character into place with your fingers.
6) Notify the EC2000's software that the character has moved. For detailed instructions, refer to section **2.9.4 How to Use the Character Mapping Page**.

4.11 How to Remove / Re-install the Embosser Module

Approximate time to remove: 15 minutes plus any sub-procedures Approximate time to re-install: 30 minutes plus any sub-procedures

The embosser module, located at the front left corner of the device, punches raised and indented characters into cards as they are held by the XY transport.

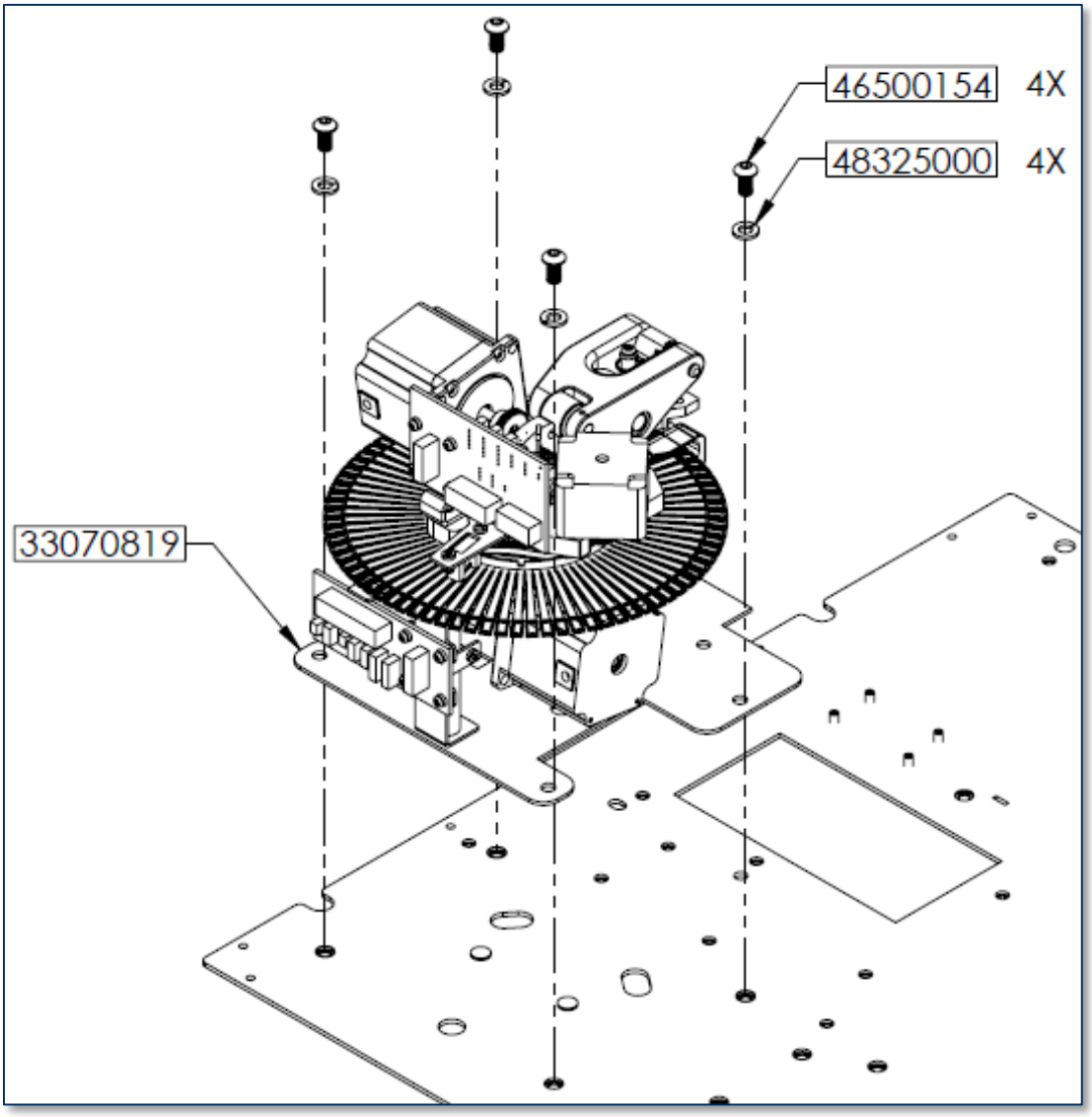


Figure 4-71 - Embosser Module (FRONT RIGHT VIEW)

To remove the embosser module, follow these steps:

1) Power on the device and open the top access door.
2) From the touchscreen, navigate to **Menu** > **Maintenance** to open the **Maintenance Menu** page.
3) If the device has a top indenter, press the **Unload Cartridge** button under **Top Indent Cartridge** to move the front indent cartridge into the unload position. Remove the top indent cartridge and set it aside in a secure location or give it to the customer for temporary storage or secure disposal.

4) Press the **Unload Cartridge** button in the **Bottom Indent Cartridge** section to move the rear indent cartridge into the unload position. Remove the rear indent cartridge and set it aside in a secure location, or give it to the customer for temporary storage or secure disposal.
5) Prepare the device for replacing parts by following the steps in section **4.1 How to Prepare the Device for Removing / Re-installing Modules**. At the end, the device should be powered down with all external cables safely disconnected.
6) Remove the cover by following the steps in section **4.4 How to Remove / Re-install the Cover**.
7) Carefully disconnect the embosser's cable from the top deck, making sure not to break any wires. **Figure 4-72** shows the cable as seen from the left side of the device.

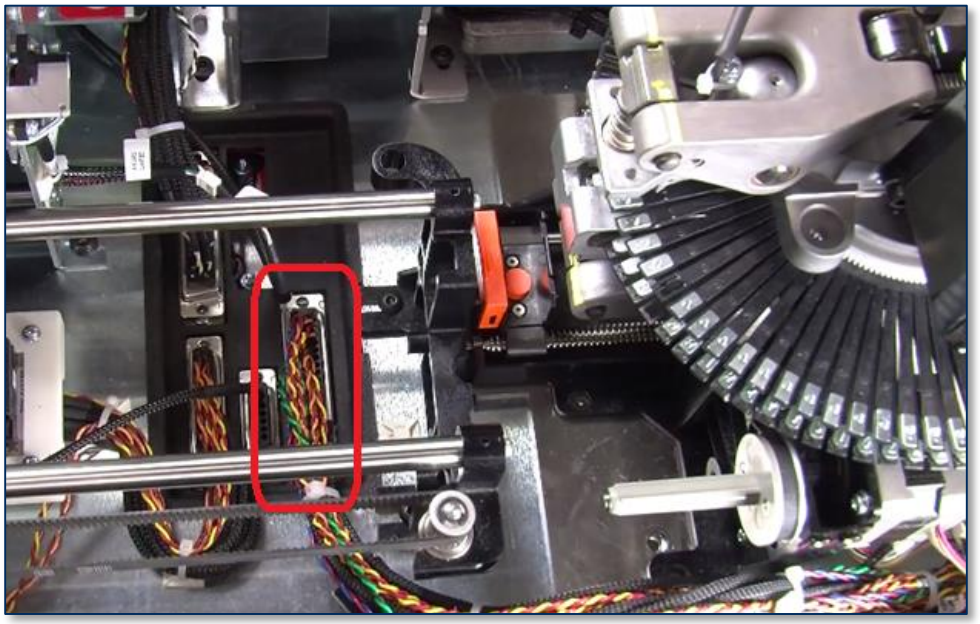


Figure 4-72 - Embosser Cable (TOP VIEW FROM LEFT)

8) Re-route the embosser cable so the connector rests on top of the XY transport rails, as shown in **Figure 4-73**.

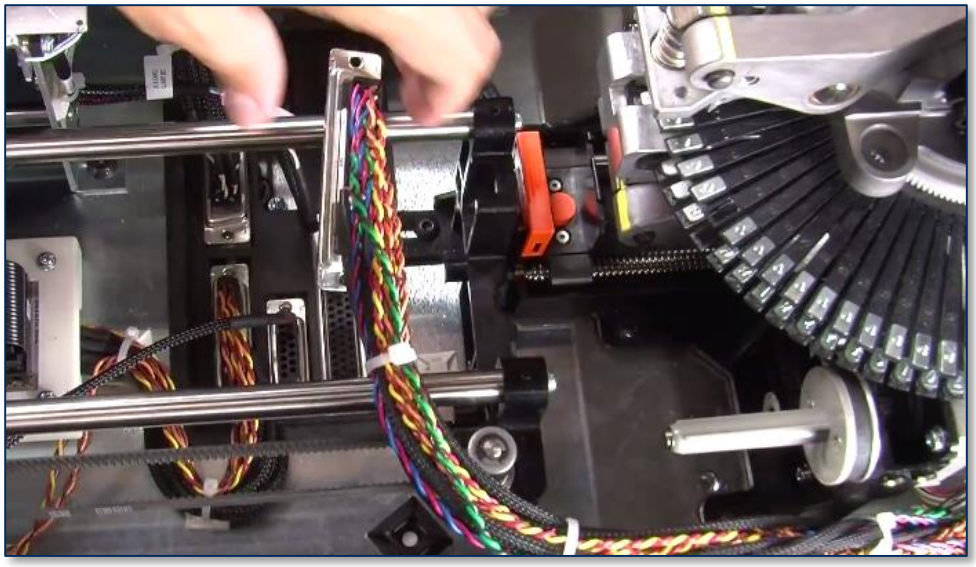


Figure 4-73 - Safe Removal Position for Embosser Cable (TOP VIEW FROM LEFT)

9) In each of the following steps, rotate the embosser daisy wheel so only empty tines are near the Allen wrench. This saves time if the wrench slips and breaks a tine; if the broken tine were not empty, you would have to re-install the font to another tine and re-map it in the software.

10) Use the 5/32" ball-end Allen wrench to remove the three screws that attach the rear indent module to the embosser. The left image in **Figure 4-74** shows two screws as seen from the left side of the device, and the right image shows the final screw as seen from the rear of the device.

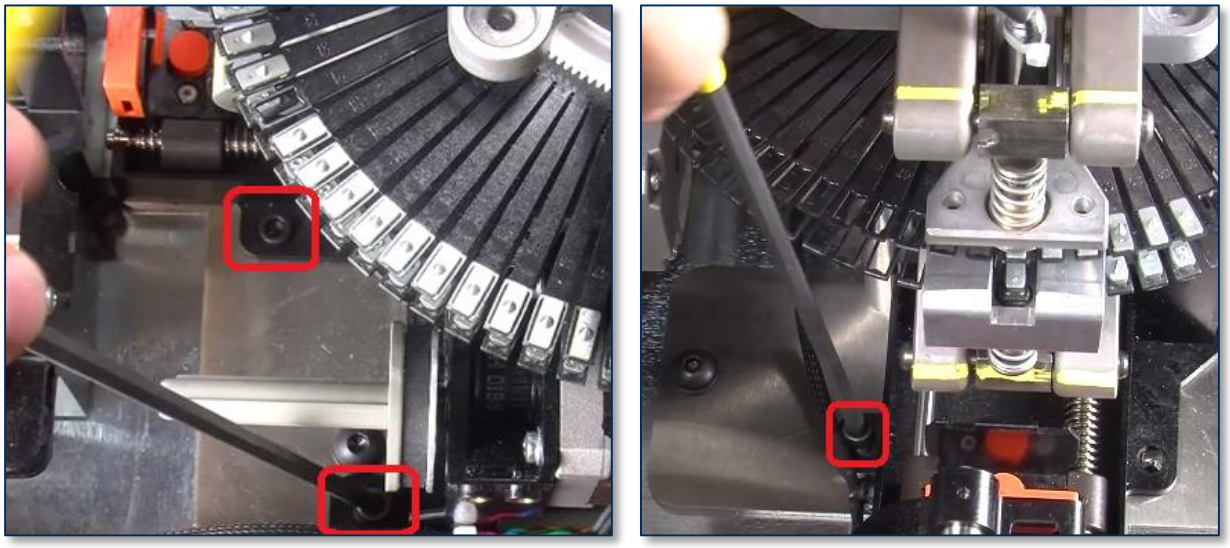


Figure 4-74 - Unfastening Rear Indent Module (TOP VIEW FROM LEFT and TOP VIEW FROM REAR)

11) Use the 5/32" ball-end Allen wrench to remove the four screws and washers that attach the embosser to the top deck plate, and set them aside. The left image in **Figure 4-75** shows two screws as seen from the front of the device, and the right image shows the other two as seen from the rear of the device.

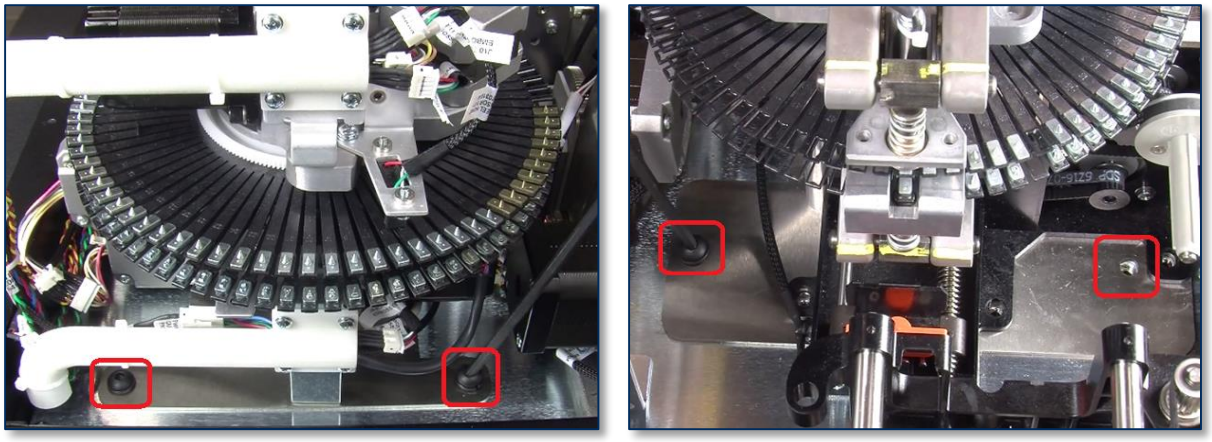
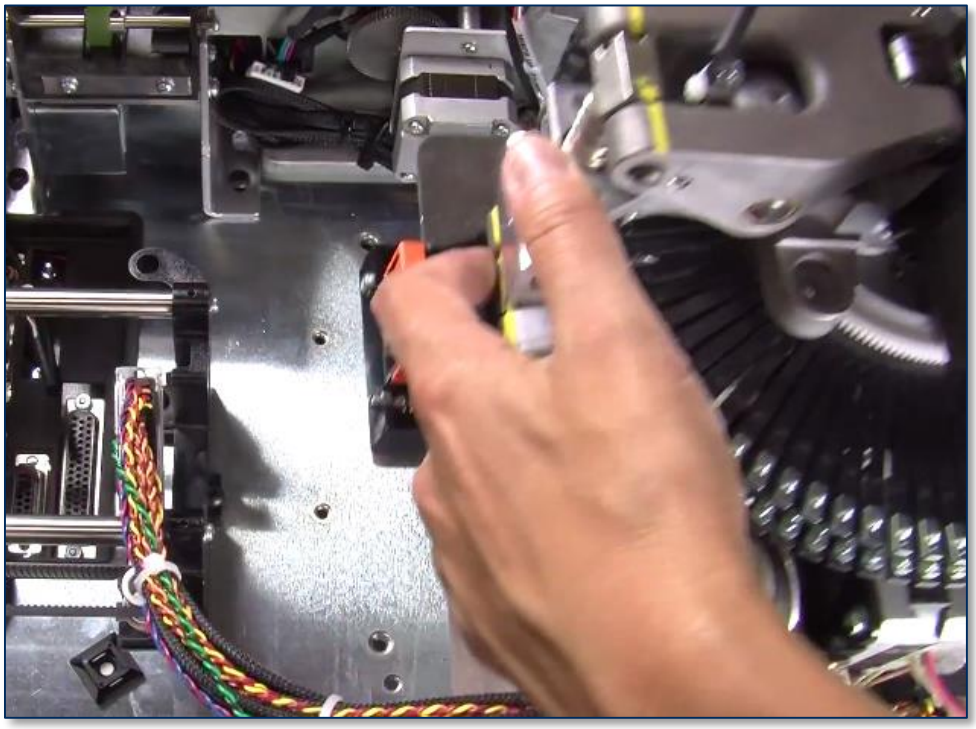


Figure 4-75 - Unfastening Embosser (TOP VIEW FROM FRONT and TOP VIEW FROM REAR)

12) Use both hands to lift the embosser and indenter modules out of the device, making sure the embosser cable does not catch on anything on the way out. Set the modules aside.

To re-install the embosser module, follow these steps:

1) Use both hands to lower the replacement embosser and indenter modules (already together), into the device in the same position and orientation as the one you just removed. Line up the four corner screw holes in the embosser with the four corresponding screw holes in the top deck plate.



2) Make sure the two raised keys stamped into the top deck plate (see **Figure 4-76**) are seated in the indentations in the base of the embosser. Push the embosser forward, backward, left, and right to make sure they are holding the embosser in place.

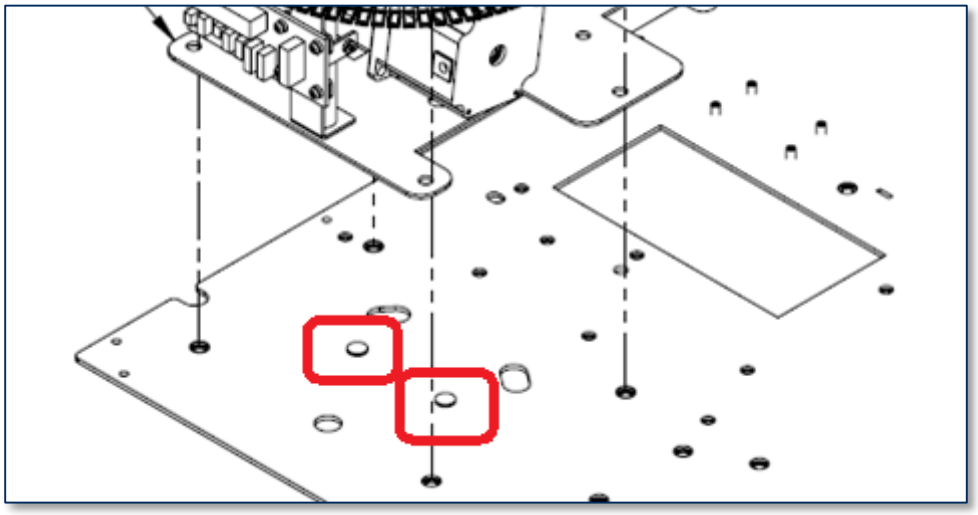
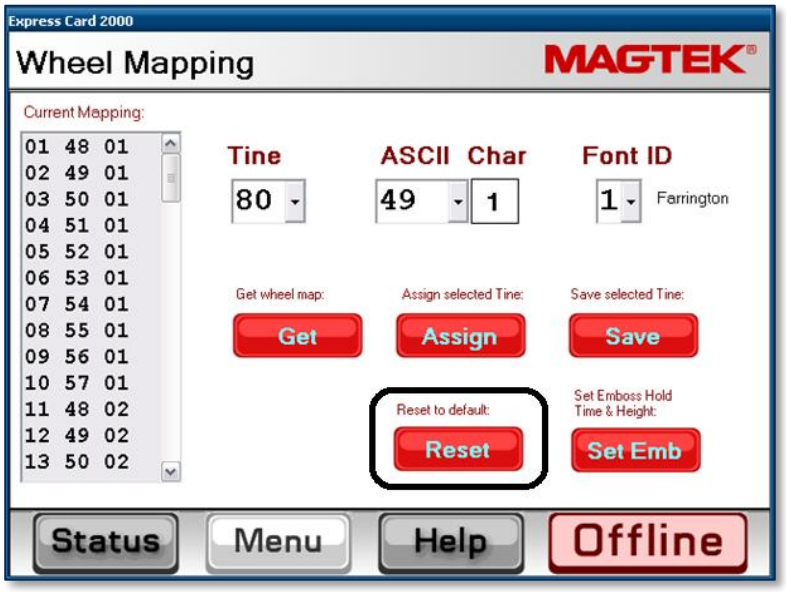


Figure 4-76 - Embosser Base Keys In Top Deck Plate (TOP RIGHT VIEW)

3) Use the 5/32" ball-end Allen wrench to re-fasten and tighten the four screws and washers that attach the corners of the embosser to the top deck plate.

4) Line up the three screw holes in the indenter module with the three screw holes in the embosser module and the top deck plate. Use the 5/32" ball-end Allen wrench to re-fasten the three screws that attach the indenter module to the embosser module.
5) Route the embosser cable along the left wall of the device, then under the XY transport belt and rails as shown in **Figure 4-72**.
6) Plug the embosser cable back in to its connector on the top deck plate. Press firmly on the two metal sides of the connector to make sure it is seated tightly.
7) Perform any additional service that requires the device to be powered off and open.
8) Re-install the cover and top access door by following the steps in sections **4.4** and **4.2** respectively.
9) Re-attach the power cable and network cable, and power on the device.
10) Use the tools found in **Menu** > **Maintenance** to re-install any indent cartridges you removed at the beginning of these steps. Install the original cartridges or obtain new ones from the customer.
11) If you have installed a new embosser with all characters in factory-default locations, and if the customer has no custom characters installed, wait until other service is complete and the device is ready to power up, then reset the character mappings in the touchscreen software as follows:
    a) From the touchscreen, navigate to **Menu** > **Settings** > **Service** > **Wheel Map** to open the first **Wheel Mapping** password page.
    b) Enter password **4567890** and press the **E** key to open the second **Wheel Mapping** password page.
    c) Enter password **0987654** and press the **E** key to open the **Wheel Mapping** page.
    d) Press the **Reset** button.



12) If the original embosser had custom characters installed, carry them over to the same locations on the new embosser's daisy wheel by following the steps in section **4.10 How to Remove / Re-install Embosser Fonts** and section **2.9.4 How to Use the Character Mapping Page**.
13) Calibrate the embosser using the information in section **5.4 How to Calibrate the Embosser**.
14) Power up the device and test it, paying special attention to the following:
    a) Navigate to **Menu** > **Settings** > **Tuning** to open the **Tuning (Move Embossing)** page.

b) Make sure the ribbon information in the upper left corner matches the ribbon you are using. If it doesn't, set and calibrate the ribbon (see the ***ExpressCard 2000 User Installation and Operation Manual*** for details).
c) Press the **Print** button. The EC2000 will create a test card with all characters and all font IDs.
d) Inspect the card to make sure the embosser is working as expected.

15) If the EC2000 does not power up or function properly, contact MagTek Support Services for assistance (see **Appendix A Technical Support**).

4.12 How to Remove / Re-install the Tipper Heater

Approximate time to remove: 15 minutes plus any sub-procedures Approximate time to re-install: 30 minutes plus any sub-procedures

The heater in the tipper module fuses the tipper foil to the embossed characters on cards. It is a replaceable part that wears out over time and must be replaced approximately every 12,000 cards.

Caution: The tipper heater is hot and can burn your skin! Make sure the device has been turned off, or the heater has been turned off and no cards have been produced, for at least 10 minutes to allow adequate cooling time before touching the tipper heater.

To remove the tipper heater, follow these steps:

1) Prepare the device for replacing parts by following the steps in section **4.1 How to Prepare the Device for Removing / Re-installing Modules**. At the end, the device should be powered down with all external cables safely disconnected.
2) Allow the tipper heater enough time to cool below 50°C so it is not too hot to couch. Cooling can take up to 15 minutes, so begin the service appointment with work away from the tipper heater.
3) Remove the tipper foil cartridge (see ***99875600 ExpressCard 2000 User Installation and Operation Manual*** for detailed instructions) and set it aside in a secure location, or offer it to the customer for temporary storage or secure disposal.
4) Locate the tipper heater cable, which comes out the front of the tipper above the exit ramp.

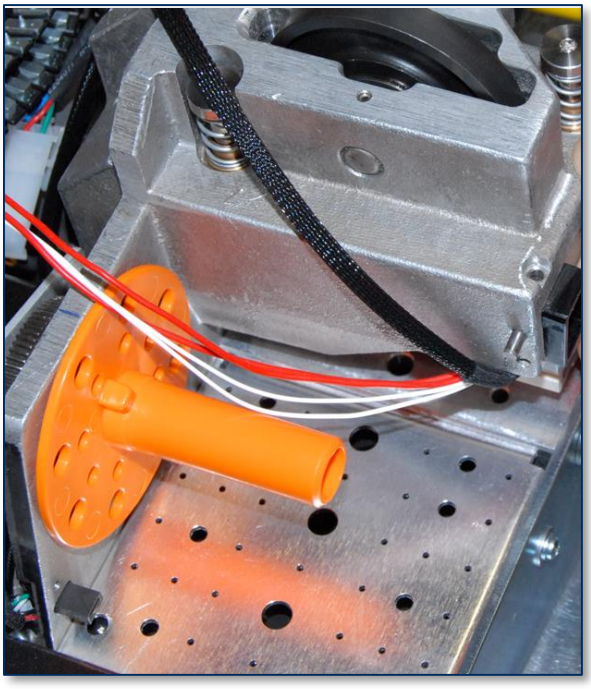


Figure 4-77 - Tipper Heater Cable (TOP VIEW FROM FRONT)

5) Cut the plastic cable tie that holds the tipper heater cable connectors to the left side of the tipper module. If the cable does not have connectors like those shown in **Figure 4-78**, you may be working on an older device; contact MagTek for alternate instructions.

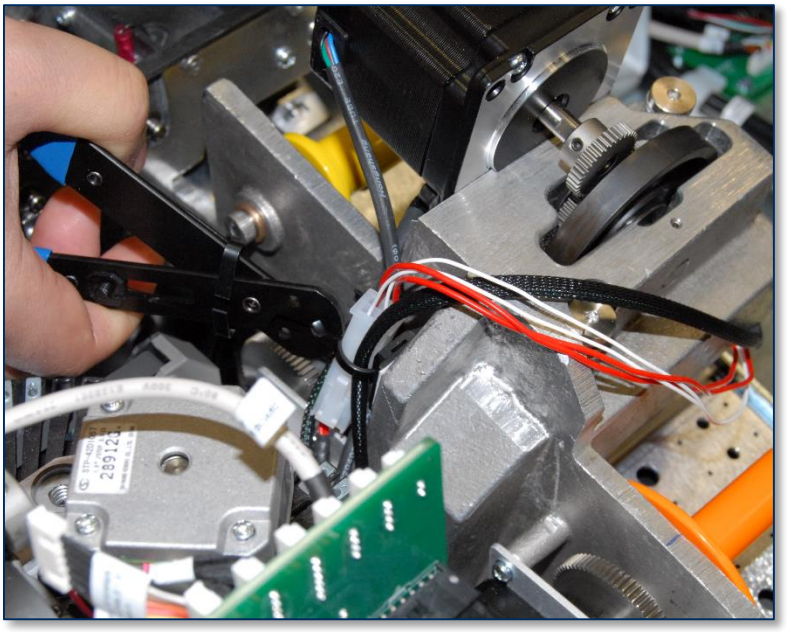


Figure 4-78 - Tipper Heater Cable Tie (TOP LEFT VIEW)

6) Unplug the tipper heater cable.

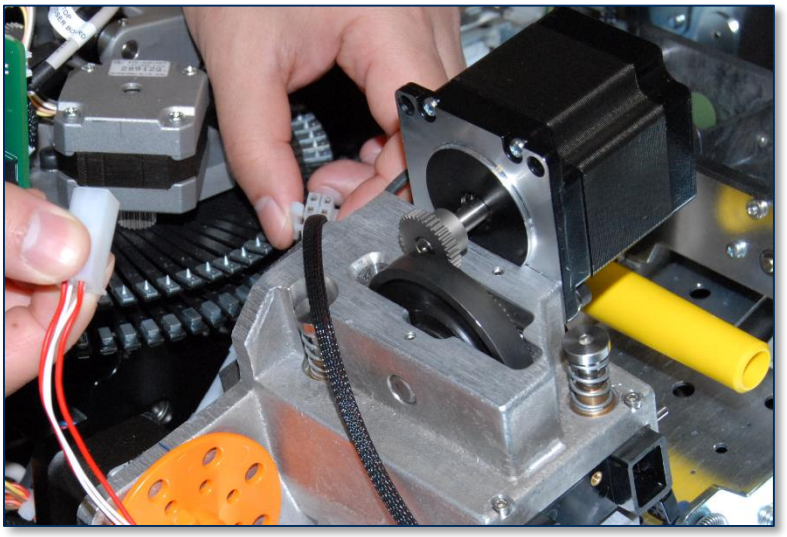


Figure 4-79 - Tipper Heater Plug (FRONT RIGHT VIEW)

7) Use the 3/32” Allen wrench to remove the two screws that secure the tipper sensor to the tipper housing, and set them aside.

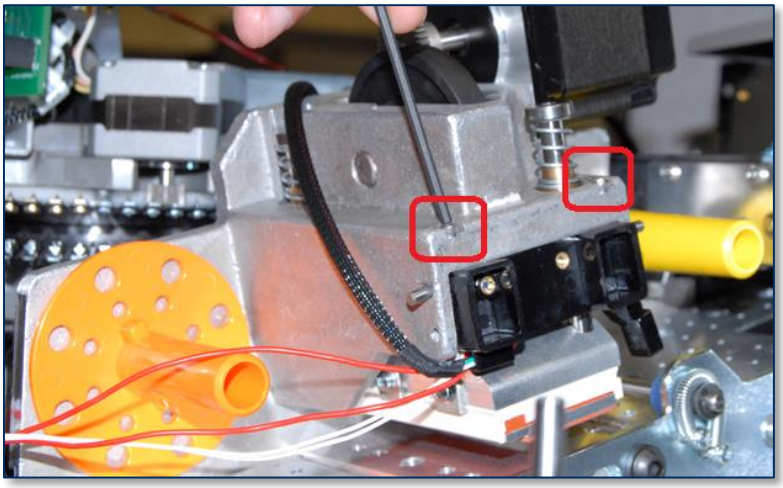


Figure 4-80 - Tipper Sensor Screws (FRONT RIGHT VIEW)

8) Carefully pull the tipper sensor out of the right side of the tipper housing, and move it out of the way by looping it up and over the top of the tipper module.

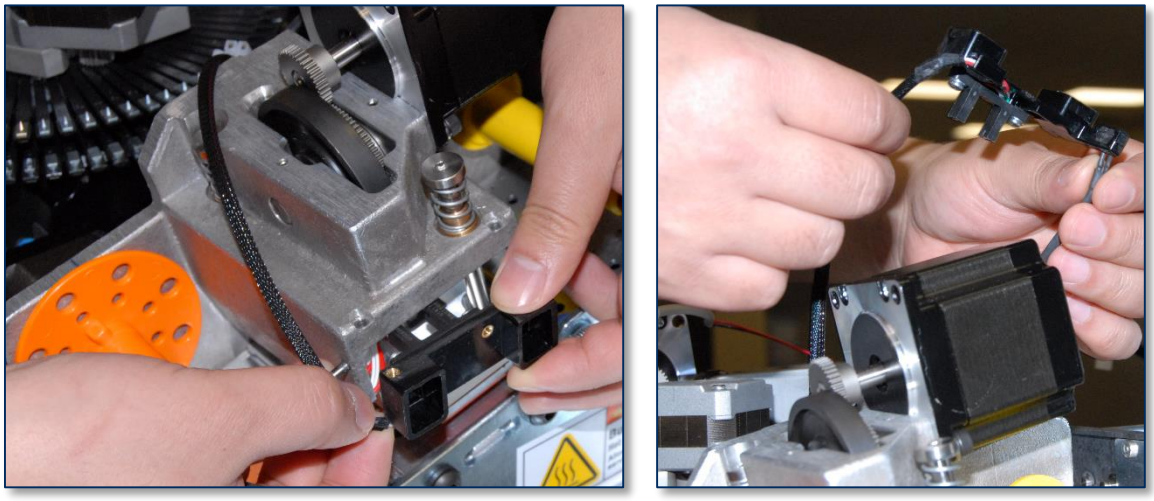


Figure 4-81 - Removing and Re-installing the Tipper Sensor (FRONT RIGHT VIEW)

9) Use the 1/8” L-handle Allen wrench to remove the two spring-loaded posts that hold the tipper heater in the tipper module, and set them aside.

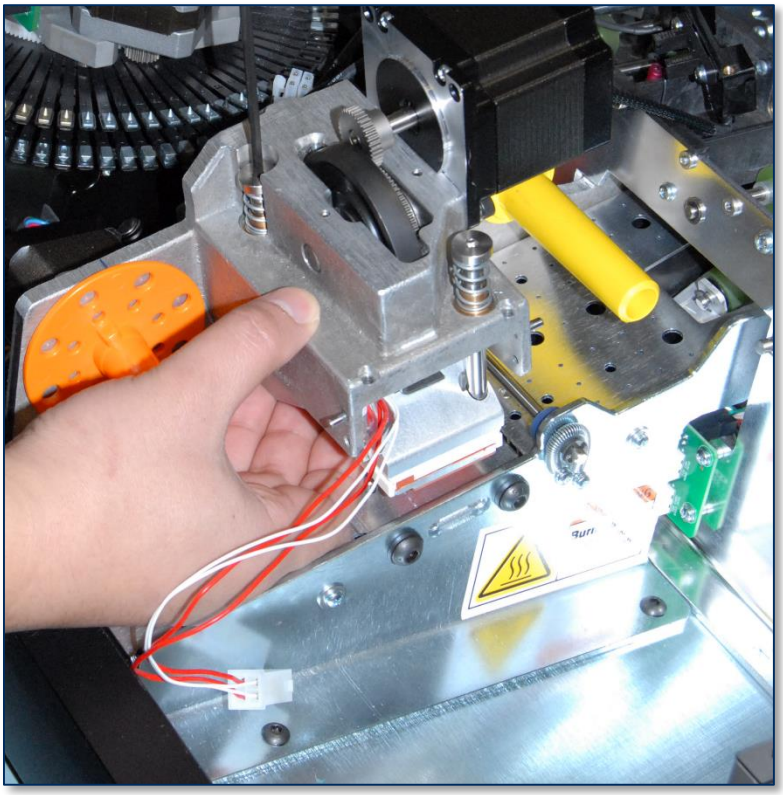


Figure 4-82 - Supporting the Tipper Heater While Removing / Tightening (RIGHT VIEW)

10) Slide the tipper heater out the right side of the tipper.

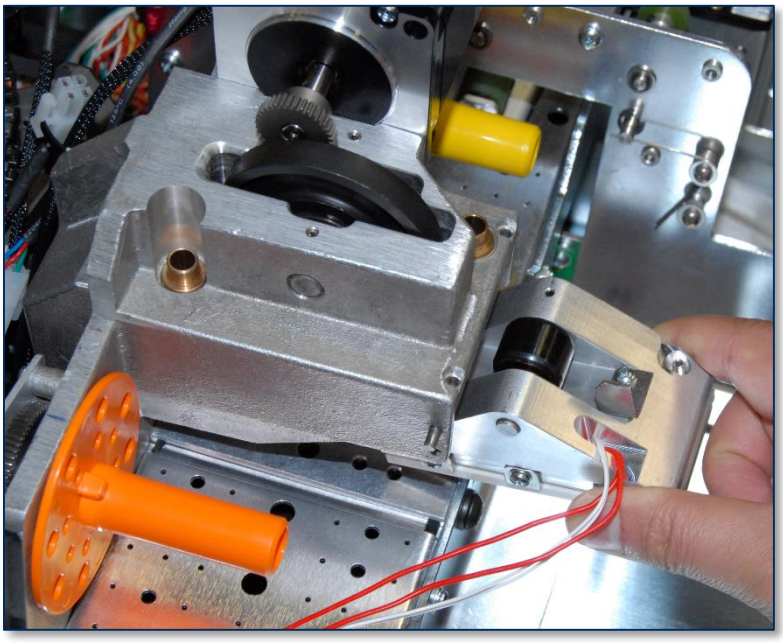


Figure 4-83 - Removing / Re-inserting the Tipper Heater (TOP VIEW FROM FRONT)

11) Determine the number of cards the tipper heater has produced, and record the number on the EC2000 Preventive Maintenance Checklist included with the replacement kit. Set the tipper heater aside to return to MagTek for recycling.

To re-install the tipper heater, follow these steps:

1) Orient the tipper heater with the flat side down and the cables coming off to the right (**Figure 4-83**).
2) Run the cable out the front of the tipper as shown in **Figure 4-77** and **Figure 4-80**.
3) Hold the tipper heater up in place with one hand as shown in **Figure 4-82**.
4) Insert and hand-tighten the **right** spring-loaded post, making sure it holds the tipper heater up.

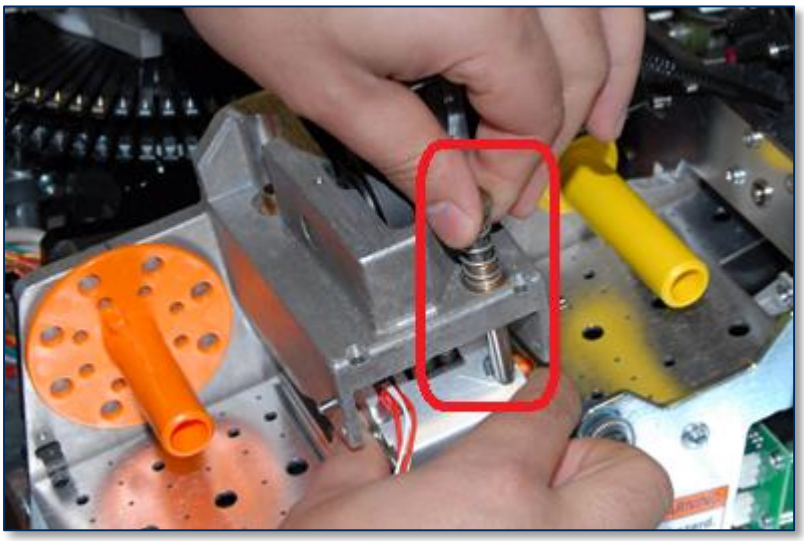


Figure 4-84 - Hand-tightening the First Spring-loaded Post (RIGHT VIEW)

5) Insert the **left** spring-loaded post, move the tipper heater around until it lines up, and use the 1/8" L-handle Allen wrench to tighten it.
6) Tighten the right spring-loaded post.
7) Re-insert the tipper sensor into its slot (see **Figure 4-81**) and hold it in place.
8) Use the 3/32" Allen wrench to insert and tighten the two screws that hold the tipper sensor (see **Figure 4-80**).
9) Re-connect the tipper heater cable to the plug on the left side of the tipper (see **Figure 4-79**).
10) Re-install a cable tie in the anchor on the left side of the tipper module. Bundle the tipper heater cable with the other cables and tie them down in the middle of the tipper heater plug (**Figure 4-78**).
11) Perform any additional service that requires the device to be powered off and open.
12) Re-install the tipper foil spool assembly with the original tipper foil roll, or obtain and install a new one from the customer.
13) Close the top access door.
14) Re-attach the power cable, network cable, and any security hardware.
15) Power up the device.
16) From the touchscreen, navigate to **Menu** > **Samples**, create a sample card, and make sure the device functions properly and the sample looks correct.
17) Return the tipper heater and report form to MagTek for recycling.

4.13 How to Remove / Re-install the Tipper and Exit Ramp Module

Approximate time to remove: 15 minutes plus any sub-procedures Approximate time to re-install: 15 minutes plus any sub-procedures

The tipper / exit ramp module receives cards from the exit transport module, stamps them with heat-fused foil from the tipper foil roll, then moves them to the card output hopper on a cushion of air. It is located in the front middle of the top deck plate, just to the rear of the card output hopper.

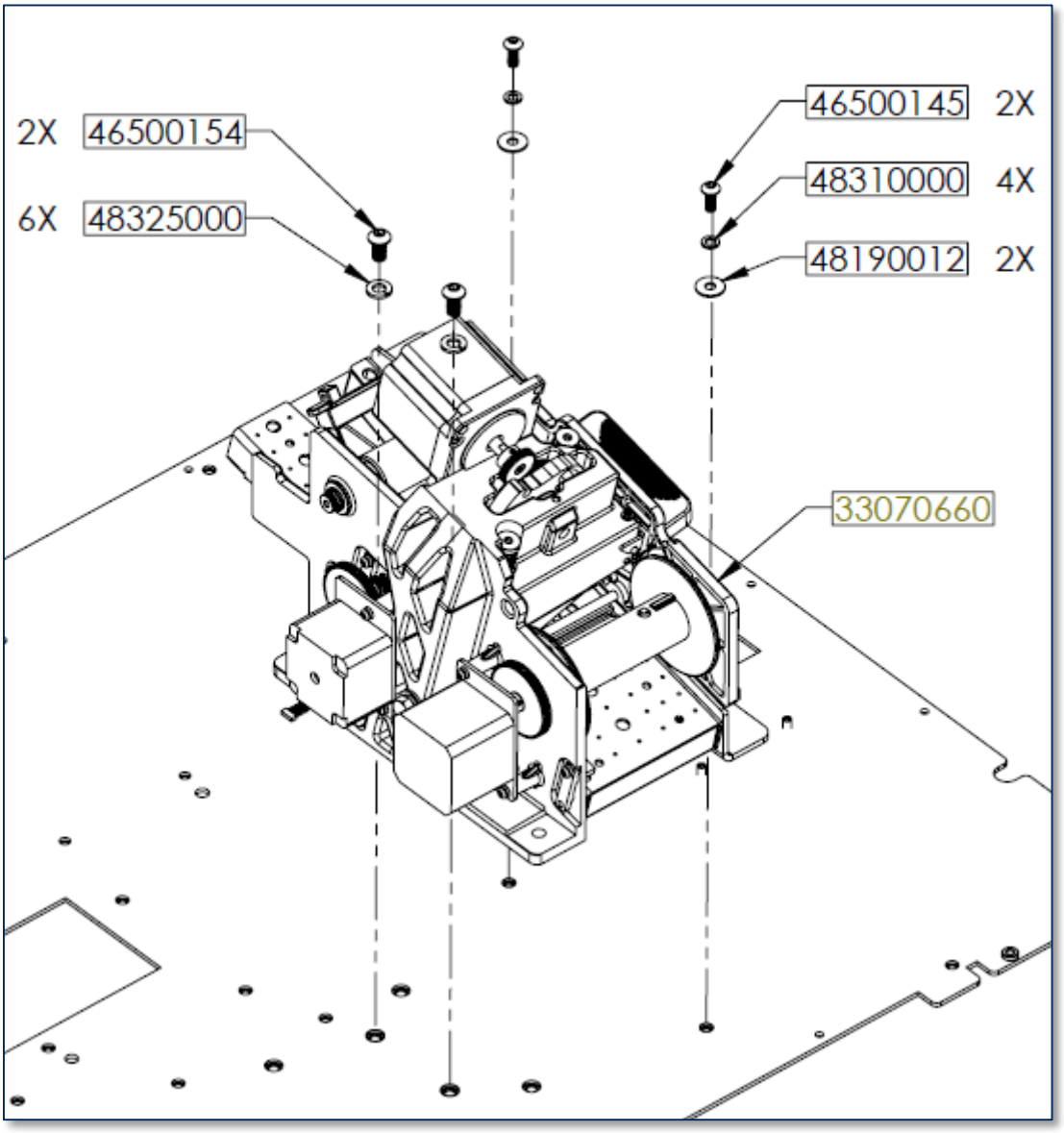


Figure 4-85 - Tipper / Exit Ramp Module (FRONT LEFT VIEW)

To remove the tipper / exit ramp module, follow these steps:

12) Prepare the device for replacing parts by following the steps in section **4.1 How to Prepare the Device for Removing / Re-installing Modules**. At the end, the device should be powered down with all external cables safely disconnected.

13) Remove the tipper foil cartridge (see ***99875600 ExpressCard 2000 User Installation and Operation Manual*** for detailed instructions) and set it aside in a secure location, or offer it to the customer for temporary storage or secure disposal.
14) Remove the cover by following the steps in section **4.4 How to Remove / Re-install the Cover**.
15) Disconnect the tipper heater plug on the left side of the tipper module (see **Figure 4-86**).

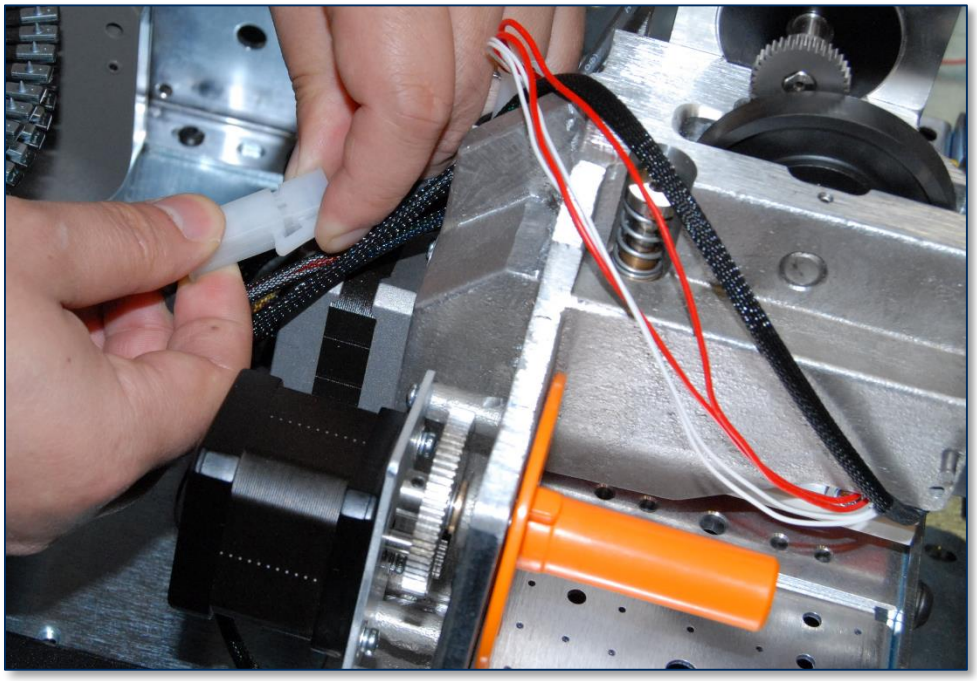


Figure 4-86 - Tipper Heater Connector (TOP VIEW FROM FRONT)

16) Unplug the top motor connector on the left side of the tipper module (see **Figure 4-87**).

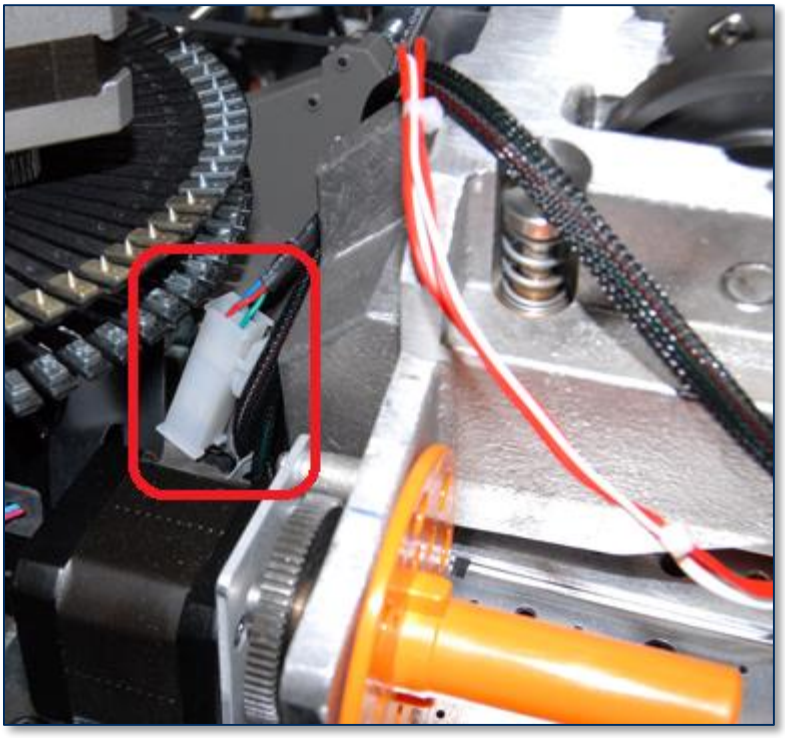


Figure 4-87 - Tipper Top Motor Connector (FRONT VIEW)

17) Remove the four sets of screws and washers that secure the module to the top deck plate, shown in **Figure 4-85**.

18) Use both hands to pull the tipper module toward the front of the device several inches to give room to disconnect the cables plugged in to the breakout circuit board mounted to the exit transport module behind it (see **Figure 4-88**). Pay careful attention to any nearby wires as you pull it forward.

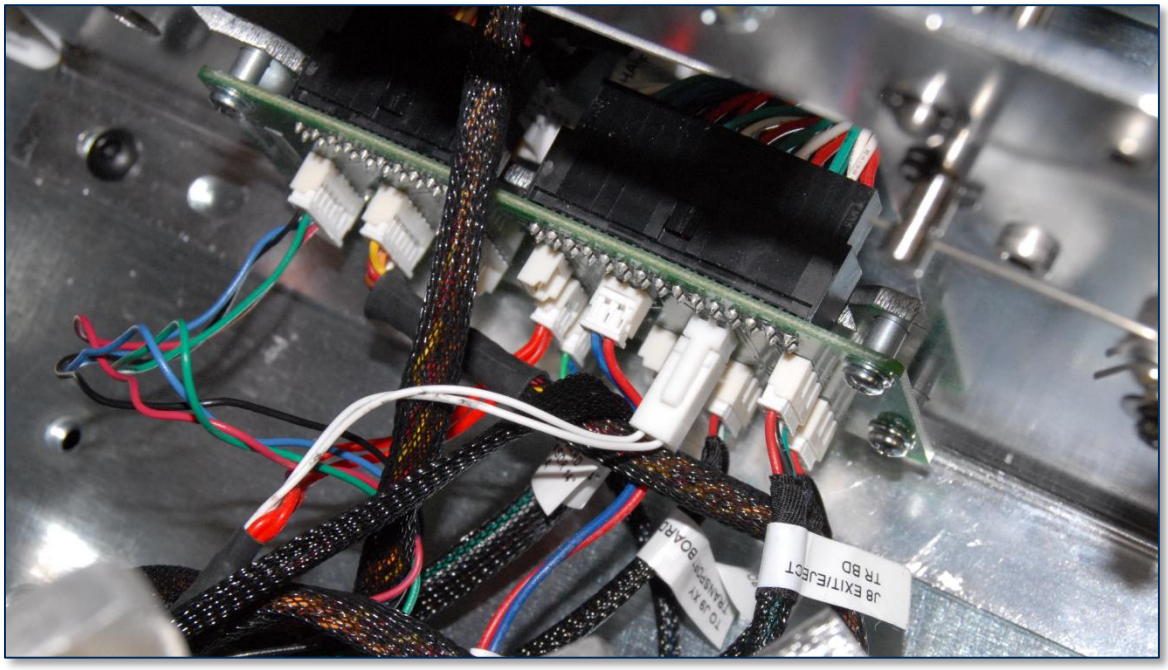


Figure 4-88 – Breakout Board Behind Tipper and Exit Ramp Module (TOP VIEW FROM FRONT)

19) Disconnect the following connectors from the breakout board behind the tipper, working from the left side of the device to the right side. Use **Figure 4-89** as a reference, and keep track of which cable connected to which connector:
    a) From connector J4 on the board, disconnect the Tipper Foil Advance Motor cable.
    b) From connector J3 on the board, disconnect the Tipper Cog Grip Motor cable.
    c) From connector J15 on the board, disconnect the Tipper RTD cable.
    d) From connector J14 on the board, disconnect the Tipper Heater cable.
    e) From connector J17 on the board, disconnect the Tipper Foil Advance Hall Sensor cable.
    f) From connector J12 on the board, disconnect the Exit Fan cable.
    g) From connector J8 on the board, disconnect the Tipper Card Grip Sensor cable.
    h) From connector J7 on the board, disconnect the Tipper Cam Home Sensor cable.
    i) From connector J9 on the board, disconnect the Tipper Card Exit Sensor cable.

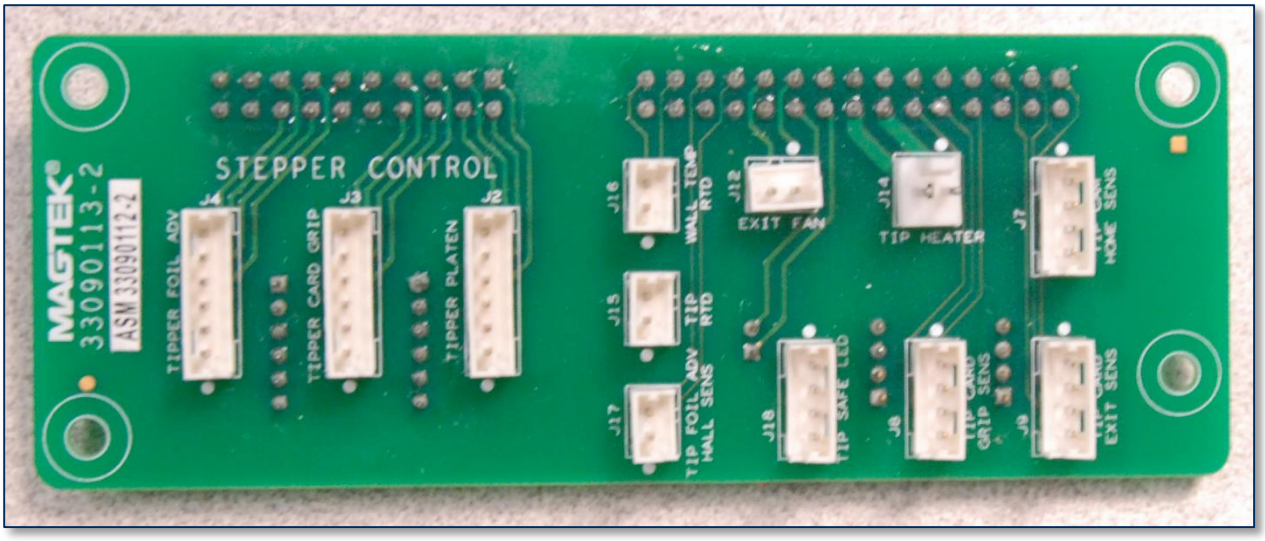


Figure 4-89 - Tipper Breakout Board (FRONT VIEW)

20) Use both hands to remove the tipper module from the device and set it aside, making sure there are no cables caught on it.

To re-install the tipper and exit ramp module, reverse the steps for removing it, making sure not to squeeze any wires between the module and any other parts in the device. To identify which cables go to which connectors, use the labels near the end of each cable, **Figure 4-88**, and **Figure 4-89**. In some cases you may want to trace the cable back to the motor or sensor it is connected to. After re-installing the module, follow these steps:

1) Perform any additional service that requires the device to be powered off and open.
2) Re-install the cover and top access door by following the steps in sections **4.4** and **4.2** respectively.
3) Re-install the tipper foil spool assembly with the original tipper foil roll, or obtain and install a new one from the customer.
4) Close the top access door.
5) Re-attach the power cable, network cable, and any security hardware.
6) Power up the device.
7) From the touchscreen, navigate to **Menu** > **Samples**, create a sample card, and make sure the device functions properly and the sample looks correct.

4.14 How to Remove / Re-install the Exit Transport Module

Approximate time to remove: 5 minutes plus any sub-procedures Approximate time to re-install: 5 minutes plus any sub-procedures

The exit transport module takes cards from the XY transport module after embossing, and moves them either to the card rejection bin or to the tipper and exit ramp. It includes an integrated MagnePrint reader, which can optionally be used to read each issued card's magnetic stripe and produce a digital identifier (or DI) for later validation that the card is genuine and that its encoded data has not been altered. The exit transport is attached to the center of the device's top deck plate.

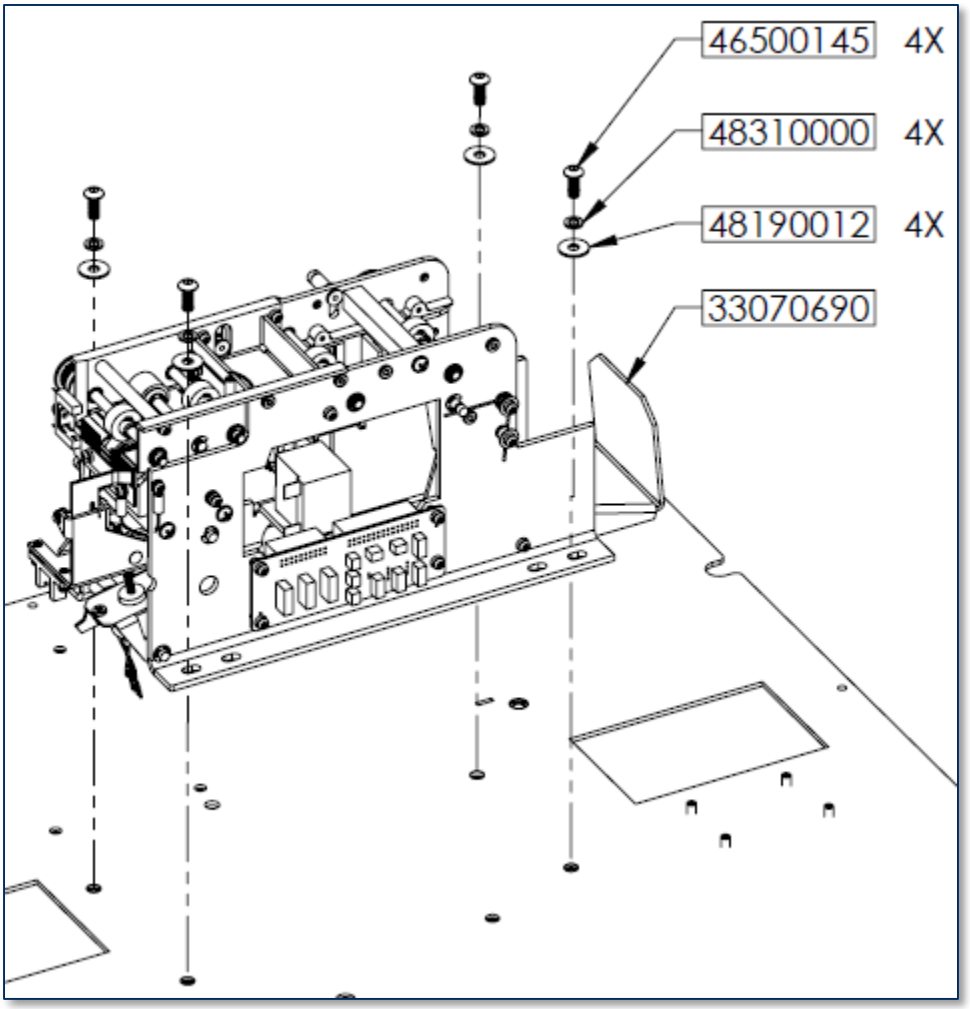


Figure 4-90 - Exit Transport Module (FRONT LEFT VIEW)

To remove the exit transport module, follow these steps:

1) Prepare the device for replacing parts by following the steps in section **4.1 How to Prepare the Device for Removing / Re-installing Modules**. At the end, the device should be powered down with all external cables safely disconnected.
2) Remove the tipper and exit ramp module. For detailed steps, see section **4.13 How to Remove / Re-install the Tipper and Exit Ramp Module**.
3) Locate the multi-connector panel in the top deck plate, to the left of the exit transport.

4) Locate the exit transport module's connector, which is connected to the rear right corner plug. See **Figure 4-91**.
5) Use a slotted screwdriver or equivalent tool to pry the sides of the connector out of the plug, then gently disconnect it. Avoid pulling directly on the wires.

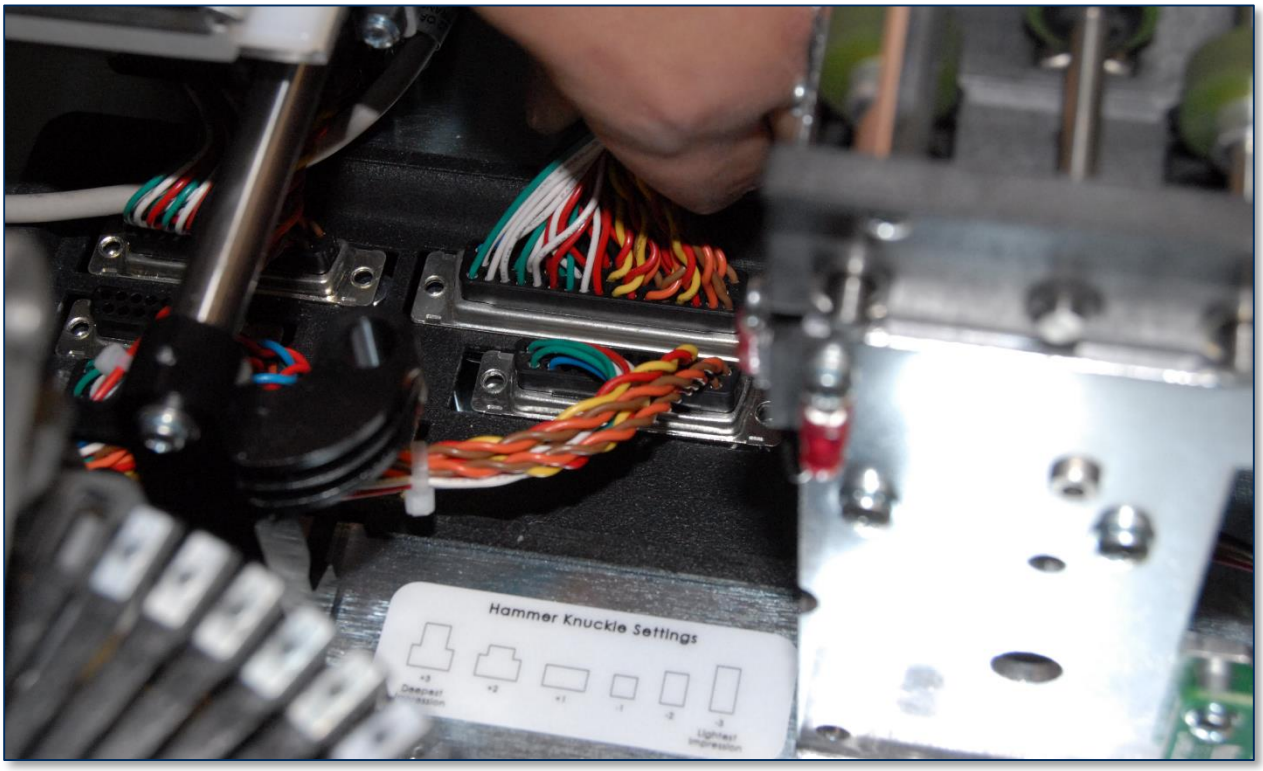


Figure 4-91 - Exit Transport Wire Tether (TOP VIEW FROM FRONT)

6) Use the 1/8" Allen wrench to remove the four screws and washers that secure the corners of the exit transport module to the top deck plate (shown in **Figure 4-90**), and set the screws aside.
7) Carefully lift the exit transport module out of the device, making sure no wires catch on it, and set it aside.

To re-install the exit transport module, reverse the steps for removing it, making sure not to squeeze any wires between the module and other parts of the device. After re-installing the module, follow these steps:

1) Perform any additional service that requires the device to be powered off and open.
2) Re-install the cover and top access door by following the steps in sections **4.4** and **4.2** respectively.
3) Close the top access door.
4) Re-attach the power cable, network cable, and any security hardware.
5) Power up the device.
6) From the touchscreen, navigate to **Menu** > **Samples**, create a sample card, and make sure the device functions properly and the sample looks correct.

4.15 How to Remove / Re-install the Embedded PC

Approximate time to remove: 15 minutes plus any sub-procedures Approximate time to re-install: 15 minutes plus any sub-procedures

The embedded PC provides the user interface on the EC2000's touchscreen and connects to the Main Logic Board (MLB) to communicate with sensors and motors within each of the device's modules. It is located in the rear right of the lower deck ("tub") in the device, and is mounted to a tray that slides into two tracks built in to the bottom of the lower deck.

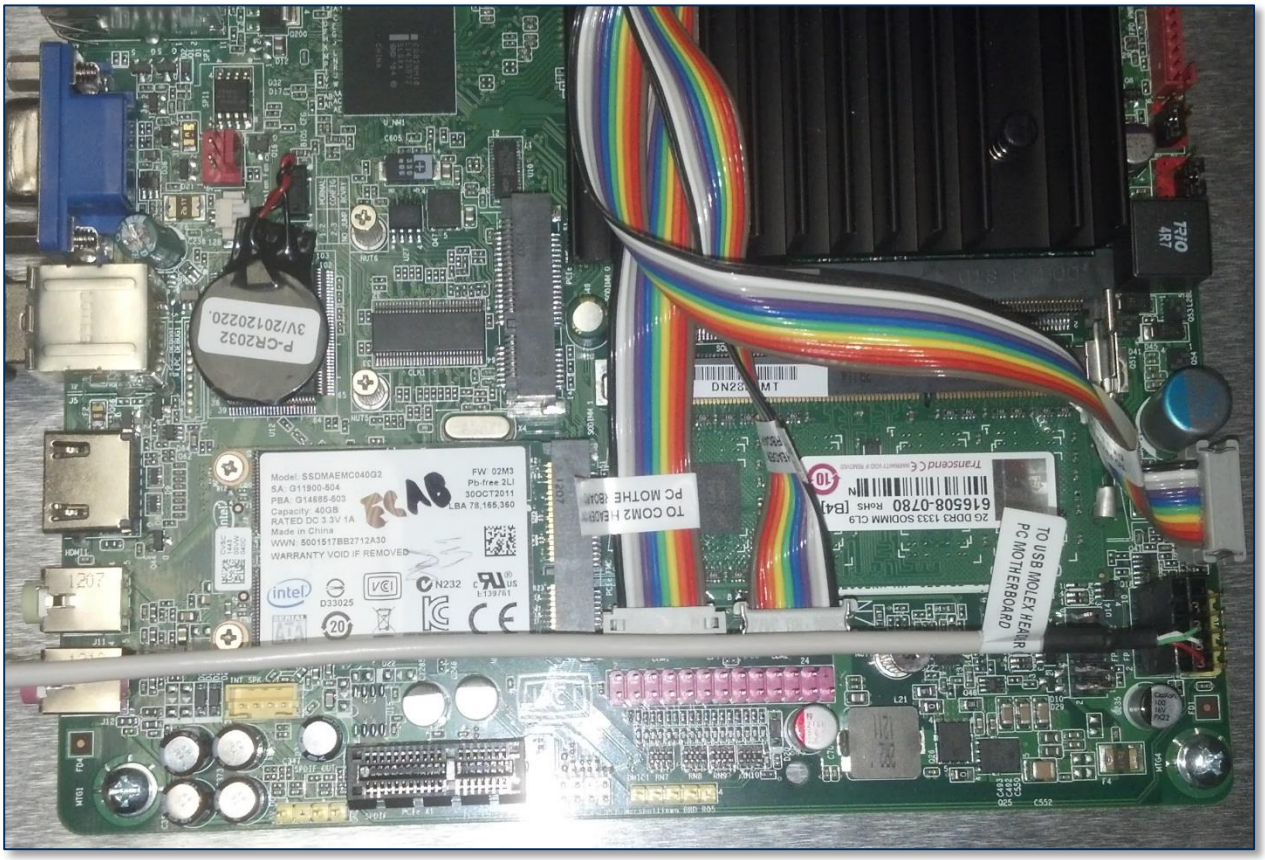


Figure 4-92 - Embedded PC (TOP VIEW FROM REAR)

To remove the embedded PC, follow these steps:

1) Prepare the device for replacing parts by following the steps in section **4.1 How to Prepare the Device for Removing / Re-installing Modules**. At the end, the device should be powered down with all external cables safely disconnected.
2) Open the **right** side access door by following the steps in section **4.3 How to Remove / Re-install the Side Access Doors**.
3) Locate the embedded PC behind the right side access door, toward the rear of the device.
4) Loosen the two thumb screws securing the embedded PC tray to the lower deck (see **Figure 4-93**) until they pop up. Do not attempt to remove them from the tray.

Figure 4-93 - Embedded PC Thumb Screws (RIGHT VIEW)

5) Use the finger holes to slowly and carefully pull the embedded PC out just far enough to make the connectors along its edge accessible (see **Figure 4-94**). While pulling, use a flashlight and other tools as appropriate to make sure its cables do not snag inside the device.

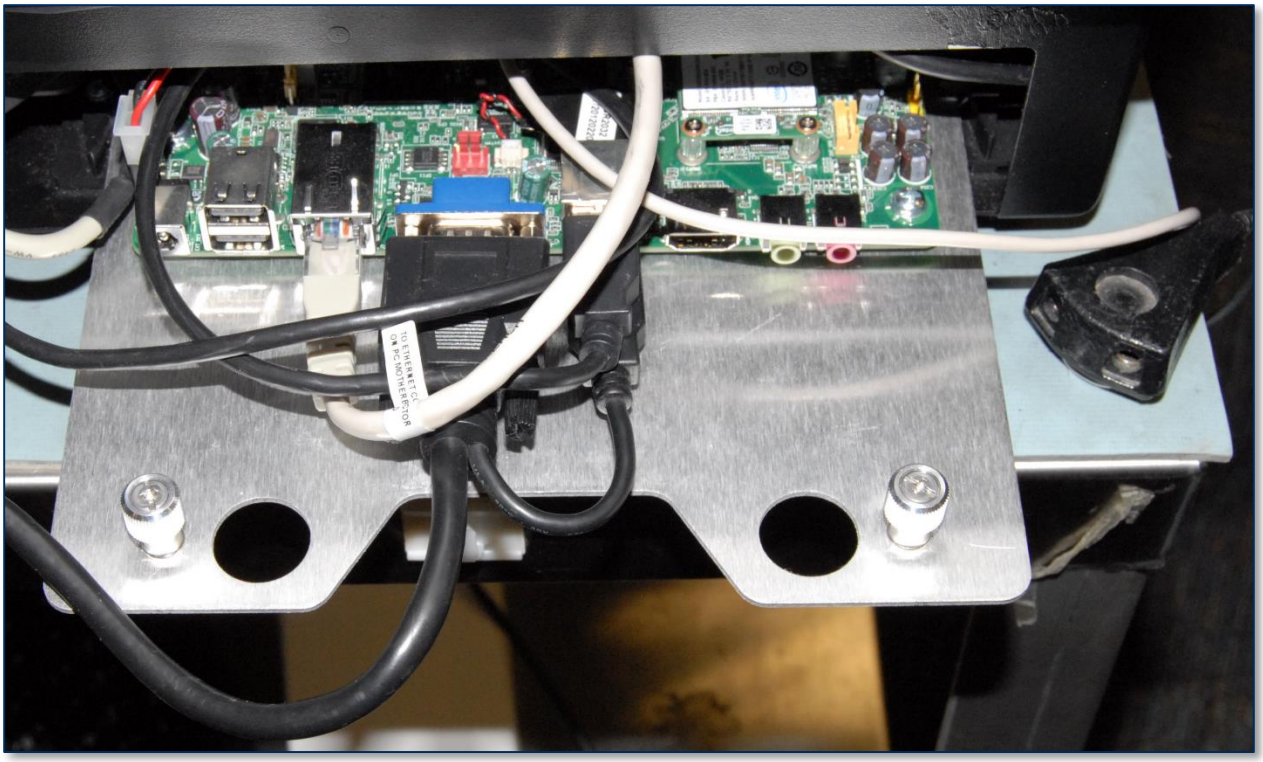


Figure 4-94 – Connectors On Right Edge of the Embedded PC (TOP VIEW FROM RIGHT)

6) Disconnect all the cables connected along the right edge of the embedded PC, plus the power connector near the front edge. The connectors are shown in **Figure 4-95**.

Figure 4-95 - Connectors Near Right Edge of Embedded PC (TOP VIEW FROM RIGHT)

7) Slowly and carefully continue to pull the embedded PC out further until you can see the remaining cables connected to its left half, as shown in **Figure 4-96**. While pulling, use a flashlight and other tools as appropriate to make sure its cables do not snag inside the device.
8) Support the embedded PC with your hand or on the tabletop while completing the final steps.

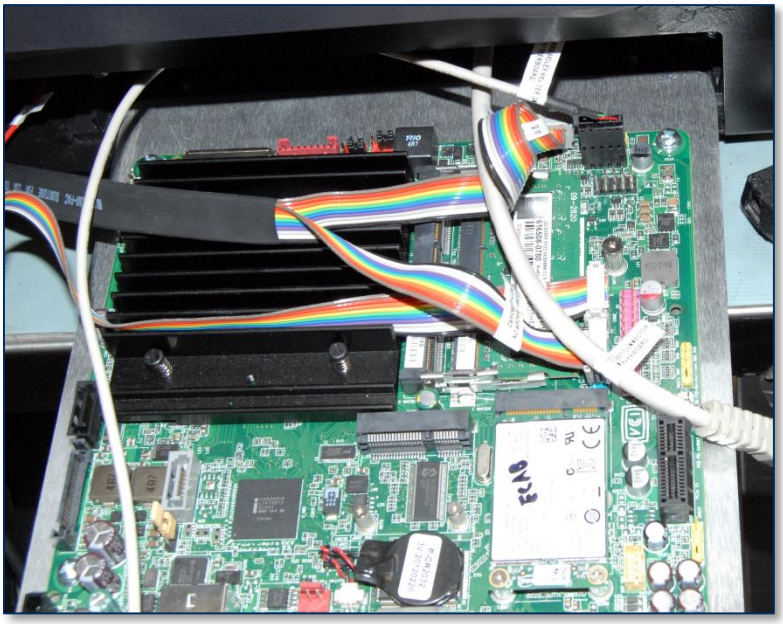


Figure 4-96 - Embedded PC Left Edge Visible (TOP VIEW FROM RIGHT)

9) Disconnect the remaining cables (see **Figure 4-97**), including at least two ribbon cables connected to COM1 and COM2, and one ribbon cable connected to the multi-colored front panel connector. If there is silicone adhesive holding any of the connectors, remove it completely.

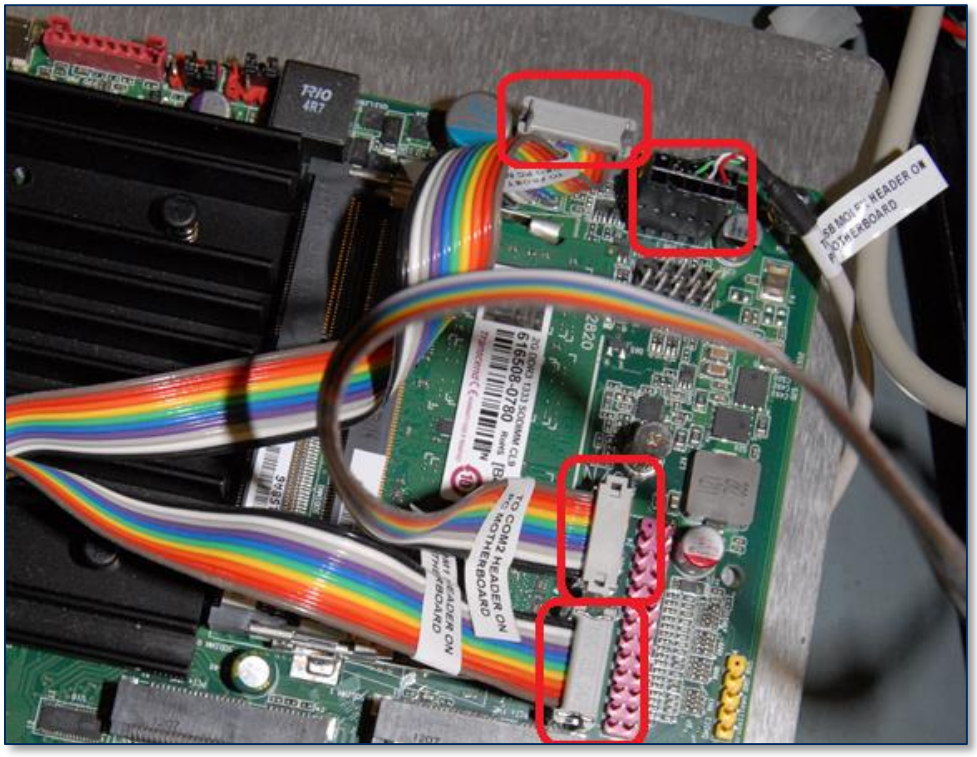


Figure 4-97 - Connectors On Left Half of Embedded PC (TOP VIEW FROM RIGHT)

10) Make sure there are no cables connected to the embedded PC, set it aside on a suitable work surface, and remove any remaining adhesive.

To re-install the embedded PC, reverse the steps you followed to remove it:

1) Re-connect the cables that attach to the left half of the embedded PC (see **Figure 4-97**), including at least two ribbon cables connected to COM1 and COM2, and one ribbon cable connected to the multi-colored front panel connector.
2) If you have connected one or more cables for magnetic stripe readers (identified by a label calling out Molex headers or by being connected to a header labeled as USB), apply silicone adhesive along the right edge of each connector to hold it in place as shown in **Figure 4-98**.

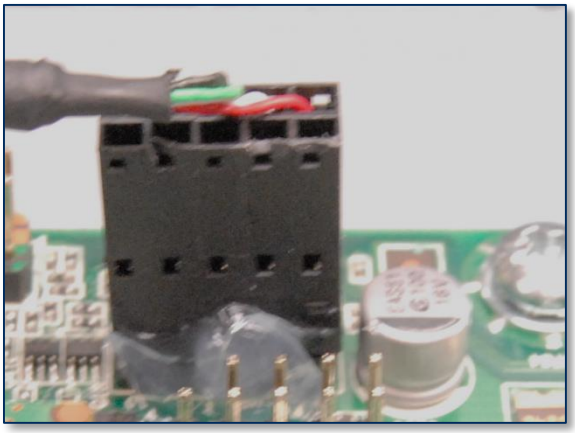


Figure 4-98 - Silicone Adhesive On MSR Connector (RIGHT VIEW)

3) Line up the embedded PC tray with its tracks on the bottom of the lower deck (see **Figure 4-99**).

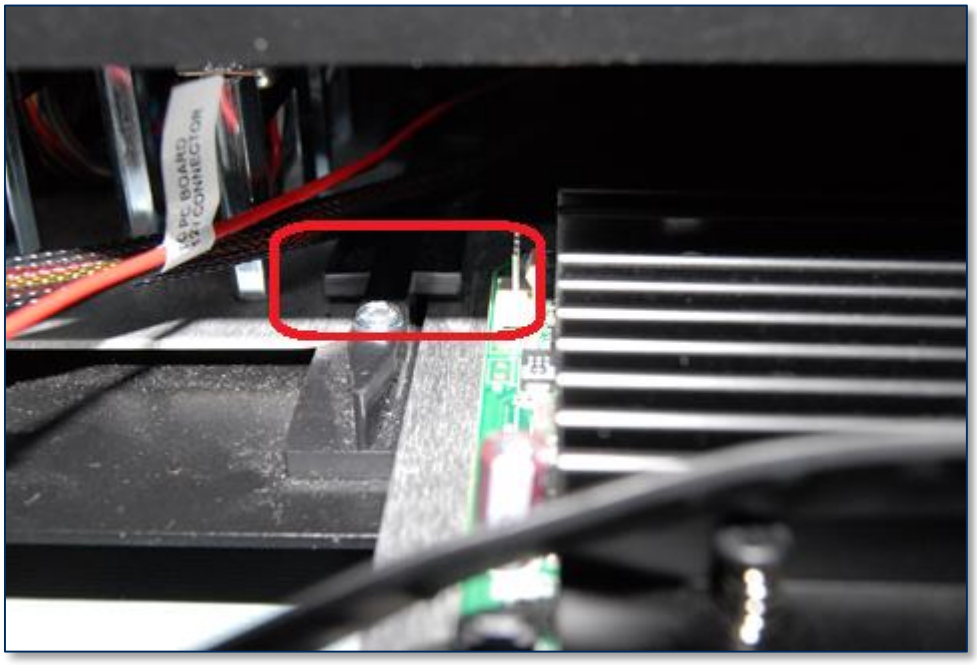


Figure 4-99 - Tracks for Embedded PC and Main Logic Board (RIGHT VIEW)

4) Carefully push the embedded PC back into the device until only the connectors along its right edge are exposed (see **Figure 4-94**). While pushing, use a flashlight and other tools as appropriate to make sure its cables do not snag inside the device.

5) Re-connect all remaining cables to the connectors along the right edge of the embedded PC, and the power connector near the front edge. The connectors are shown in **Figure 4-95**. Tighten the VGA cable's screw posts to secure it in place.
6) Continue pushing the embedded PC into the device until the two thumb screws that secure it to the lower deck line up with their holes (see **Figure 4-93**). Do not push it too far in.
7) Tighten the thumb screws.
8) Tuck the cables back into the space behind the right side access door.
9) Close the right side access door by following the steps in section **4.3 How to Remove / Re-install the Side Access Doors**.
10) Depending on the situation, it may be necessary to complete additional software or hardware configuration steps as directed by your reseller, MagTek Support Services, or MagTek Engineering, BEFORE powering up the device.
11) Perform any additional service that requires the device to be powered off and open.
12) Close the top access door.
13) Re-attach the power cable, network cable, and any security hardware.
14) Power up the device.
15) From the touchscreen, navigate to **Menu** > **Samples**, create a sample card, and make sure the device functions properly and the sample looks correct.

4.16 How to Remove / Re-install the Embedded PC Solid State Drive (SSD)

Approximate time to remove: 5 minutes plus any sub-procedures Approximate time to re-install: 5 minutes plus any sub-procedures

The embedded PC's solid state drive (SSD) contains its operating system and software. It is mounted to the embedded PC in the rear right corner of the lower deck ("tub") of the device.

To remove the embedded PC's SSD, follow these steps:

1) Prepare the device for replacing parts by following the steps in section **4.1 How to Prepare the Device for Removing / Re-installing Modules**. At the end, the device should be powered down with all external cables safely disconnected.
2) Perform the first few steps in section **4.15 How to Remove / Re-install the Embedded PC** just to the point where the SSD is accessible (see **Figure 4-100**).

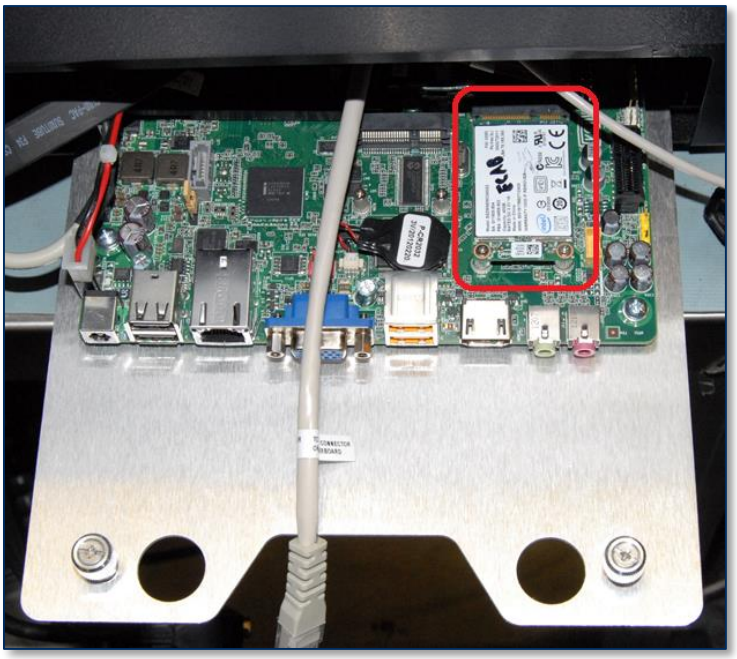


Figure 4-100 - Embedded PC Solid State Drive (TOP VIEW FROM RIGHT)

3) Use the No. 1 Philips screwdriver to remove the two screws securing the SSD. Upon removing the second screw, the edge of the SSD should pop up on its own. See **Figure 4-101**.

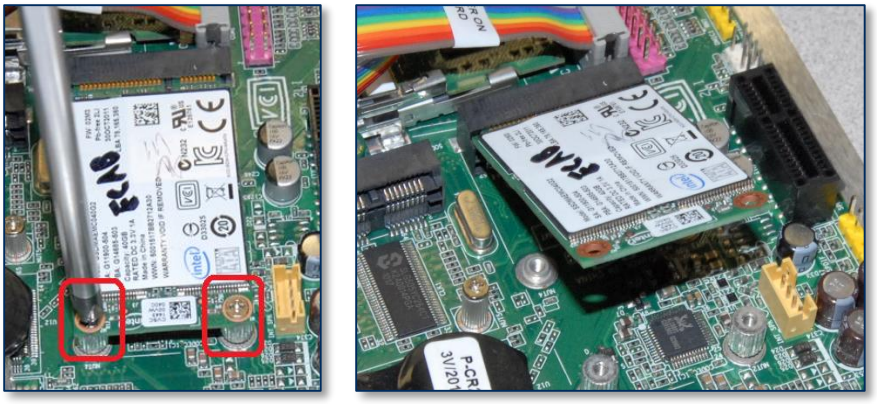


Figure 4-101 - Solid State Drive Screws (TOP VIEW FROM RIGHT)

4) Remove the SSD from the embedded PC and set it aside.

To re-install the embedded PC's SSD, follow these steps:

1) Insert the SSD into its slot at a slight incline. The end opposite the connector should be slightly higher than the end that goes into the connector, as shown in **Figure 4-101**.
2) Use the No. 1 Philips screwdriver to insert and tighten the two screws that secure the SSD.
3) Re-install the embedded PC by reversing the steps you followed to pull it out partway. Use section **4.15 How to Remove / Re-install the Embedded PC** as a reference. Depending on the situation, it may be necessary to perform additional software or hardware configuration steps as directed by your reseller, MagTek Support Services, or MagTek Engineering, BEFORE powering up the device.
4) Perform any additional service that requires the device to be powered off and open.
5) Close the top access door.
6) Re-attach the power cable, network cable, and any security hardware.
7) Power up the device.
8) From the touchscreen, navigate to **Menu** > **Samples**, create a sample card, and make sure the device functions properly and the sample looks correct.

4.17 How to Remove / Re-install the Main Logic Board (MLB)

Approximate time to remove: 5 minutes plus any sub-procedures Approximate time to re-install: 5 minutes plus any sub-procedures

The main logic board (MLB) drives the device's motors and communicates with the device's sensors. It has a bi-directional data connection with the embedded PC, which both modules use to coordinate motor movements and sensor states as the device performs operations. It is located in the front right of the device's lower deck, behind the right side access door and in front of the embedded PC.

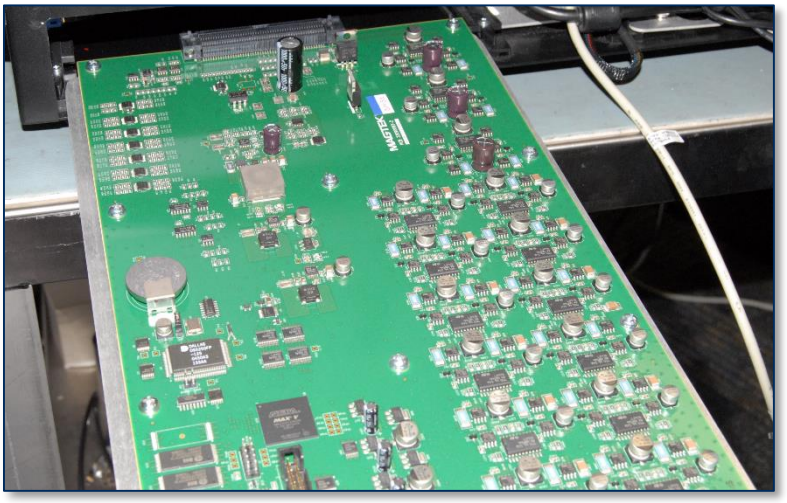


Figure 4-102 - Main Logic Board (TOP VIEW FROM RIGHT)

1) Prepare the device for replacing parts by following the steps in section **4.1 How to Prepare the Device for Removing / Re-installing Modules**. At the end, the device should be powered down with all external cables safely disconnected.
2) Open the **right** side access door by following the steps in section **4.3 How to Remove / Re-install the Side Access Doors**.
3) Locate the MLB behind the right side access door, toward the front of the device.

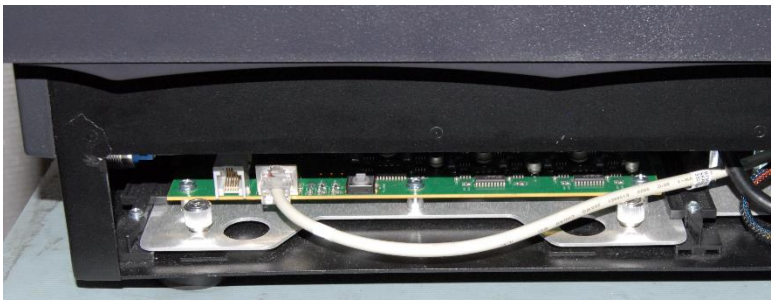


Figure 4-103 - Main Logic Board (RIGHT VIEW)

4) Disconnect the Ethernet cable connecting the MLB to the embedded PC.

Figure 4-104 - Main Logic Board to Embedded PC Connector (RIGHT VIEW)

5) Loosen the two thumb screws securing the MLB tray to the lower deck until they pop up. Do not attempt to remove them from the tray.

Figure 4-105 - Main Logic Board Thumb Screws (RIGHT VIEW)

6) Use the finger holes to slowly and carefully pull the MLB out of the device, and set it aside on an appropriate work surface.

To re-install the MLB, reverse the steps you followed to remove it. When you insert it into the device, make sure to line up the MLB tray with its tracks on the lower deck (see **Figure 4-99**). Push it gently into the slot until you feel a small amount of friction. When the thumb screws can be tightened without popping back up, it is lined up properly.

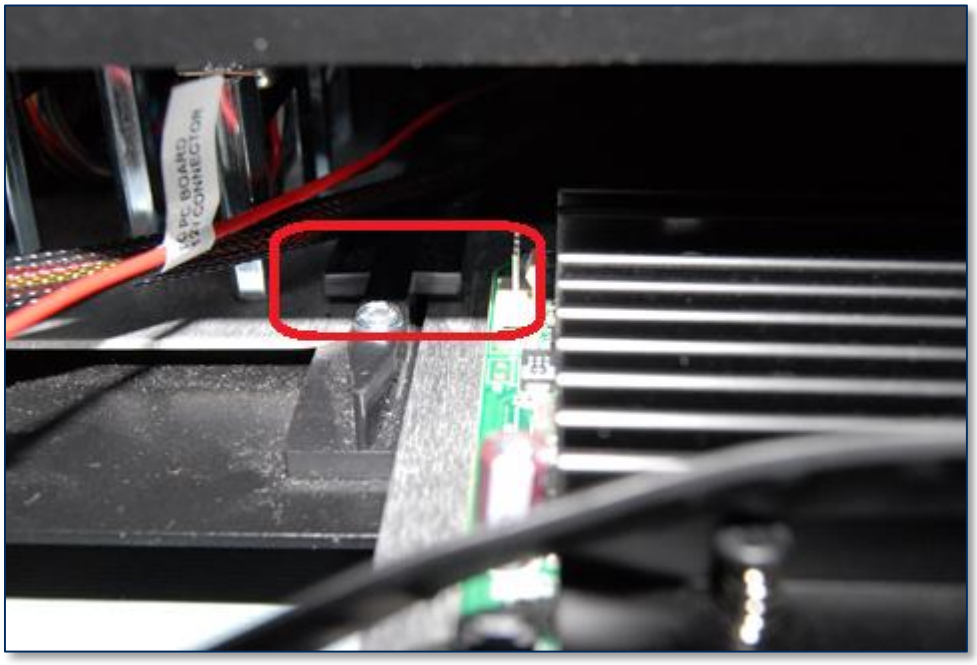


Figure 4-106 - Tracks for Embedded PC and Main Logic Board (RIGHT VIEW)

After re-installing the MLB, follow these steps:

1) Depending on the situation, it may be necessary to complete additional software or hardware configuration steps as directed by your reseller, MagTek Support Services, or MagTek Engineering, BEFORE powering up the device.
2) Perform any additional service that requires the device to be powered off and open.
3) Close the top access door.
4) Re-attach the power cable, network cable, and any security hardware.
5) Power up the device.
6) From the touchscreen, navigate to **Menu** > **Samples**, create a sample card, and make sure the device functions properly and the sample looks correct.

4.18 How to Remove / Re-install the Power Controller and Backplane

Approximate time to remove: 30 minutes plus any sub-procedures Approximate time to re-install: 30 minutes plus any sub-procedures

The power controller monitors the power button on the front of the device, and coordinates activity between the device's embedded PC, main logic board, and power supply to properly power up and power down the device. It is located in the bottom deck of the device and is attached – along with the backplane that connects the main logic board to most of the device's top-deck connectors – to a long tray that runs along nearly the entire width of the device.

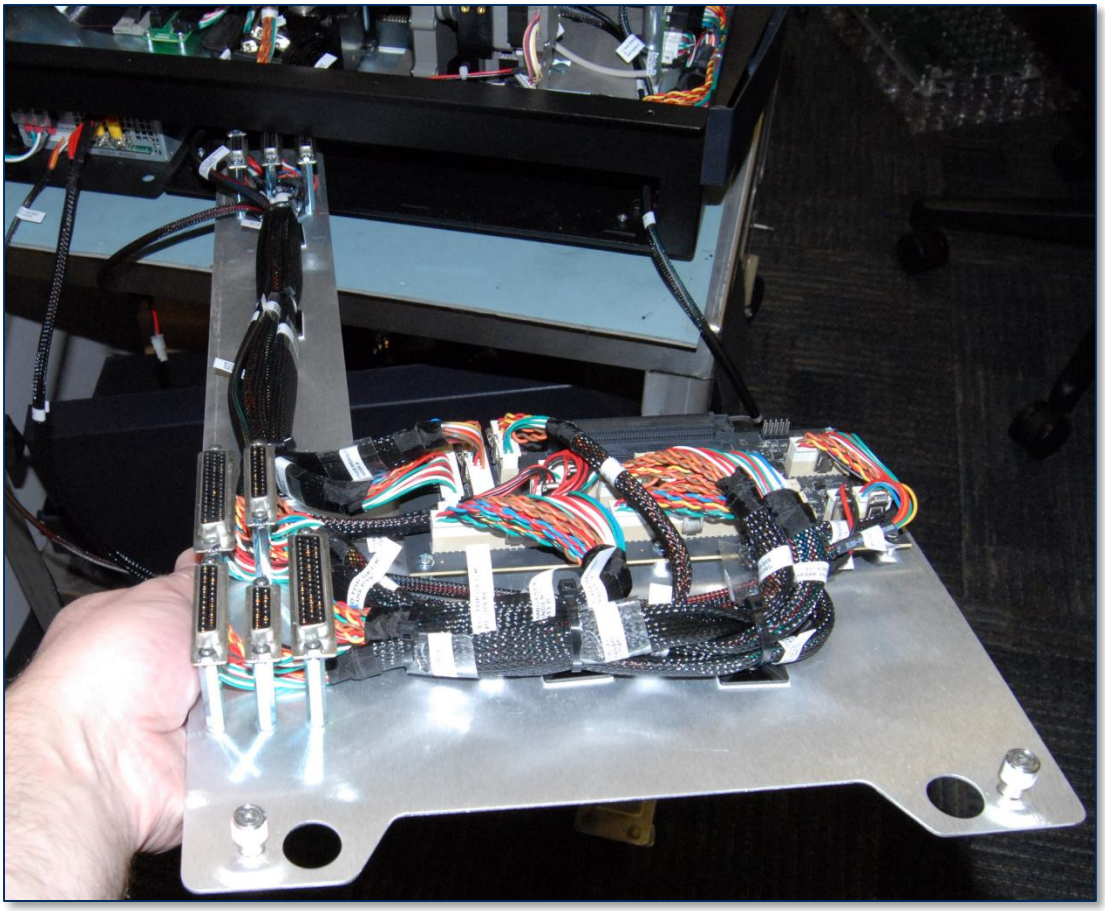


Figure 4-107 - Power Controller and Backplane Connector (LEFT VIEW)

To remove the power controller and backplane, follow these steps:

1) Prepare the device for replacing parts by following the steps in section **4.1 How to Prepare the Device for Removing / Re-installing Modules**. At the end, the device should be powered down with all external cables safely disconnected.
2) Open the top access door (see section **2.7 How to Open the Top Access Door**). If you have difficulty with the clearances within the device when performing this procedure, you may optionally remove the entire cover by following the steps in section **4.4 How to Remove / Re-install the Cover**.
3) Remove both side access doors by following the steps in section **4.3 How to Remove / Re-install the Side Access Doors**.

4) On the right side of the device, pull the embedded PC out a few inches by following the first few steps in section **4.15 How to Remove / Re-install the Embedded PC**.
5) Disconnect the plug that connects the embedded PC's COM2 port to the power controller, as shown in **Figure 4-108**.

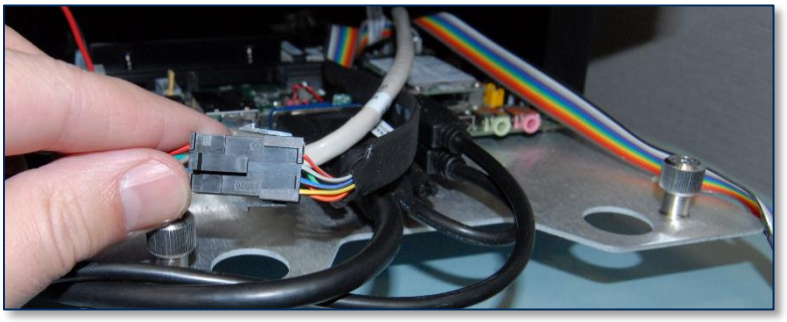


Figure 4-108 - Embedded PC Communication Input from Power Controller (RIGHT VIEW)

6) Disconnect the plug that connects the embedded PC's power input to the power controller, as shown in **Figure 4-109**.

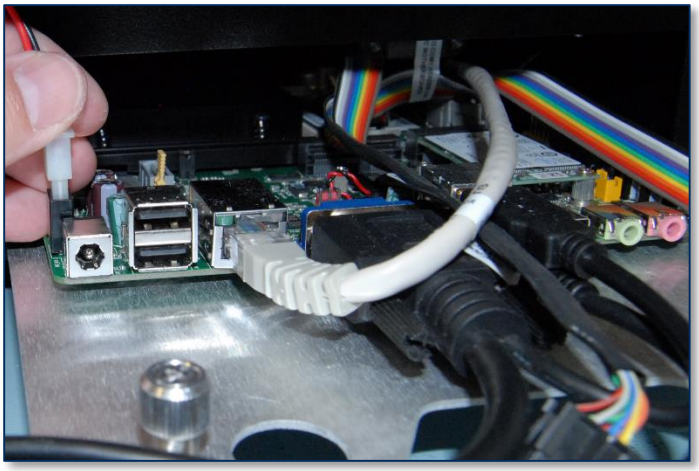


Figure 4-109 - Embedded PC Power Input from Power Controller (RIGHT VIEW)

7) Use the 5/64" Allen wrench to remove the five screws that secure the hopper deck plate to the hopper module, and carefully move the hopper deck plate out of the way to access the right connector panel underneath it (see **Figure 4-110**).

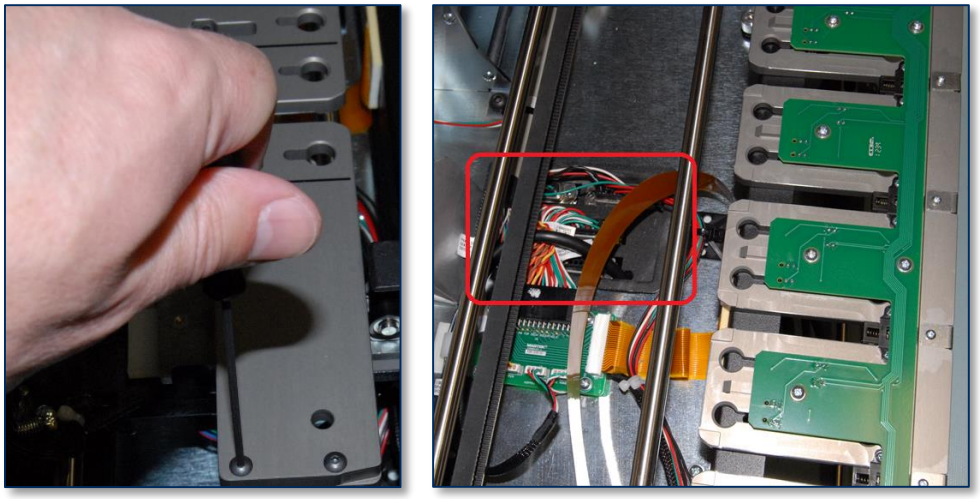


Figure 4-110 - Right Connector Panel Below Hopper Deck (TOP VIEW FROM FRONT)

8) Unplug all four connectors from the right connector panel, noting which cable connects where.
9) Locate the left connector panel, near the exit transport and behind the embosser (see **Figure 4-111**).

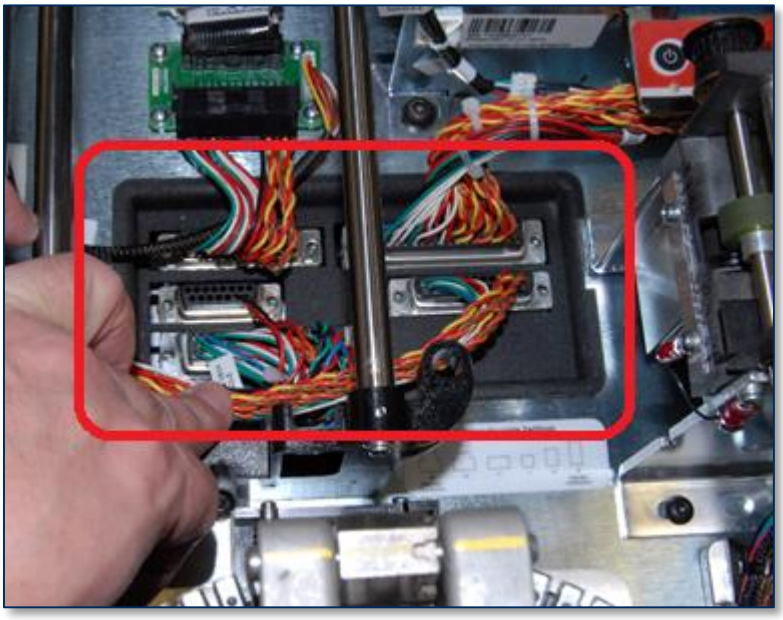


Figure 4-111 - Left Connector Panel (TOP VIEW FROM FRONT)

10) Unplug all five connectors from the left connector panel, noting which cable connects where.
11) Behind the left side access door, locate the power controller, indicated in **Figure 4-112**.

Figure 4-112 - Power Controller (LEFT VIEW)

12) Unscrew the thumb screws on the front and rear of the power controller to disengage it from the bottom deck. The screws are part of the power controller tray and should spring up when they are disengaged. Do not attempt to remove them from the tray.

13) Lift the cables that run across the edge of the power controller tray to the power supply, and use the finger holes to pull the power controller out a few inches to expose the three connectors near the front of the printed circuit board, as shown in **Figure 4-113**.
14) Disconnect the cables from the three connectors, and move them out of the way toward the outsides of the left side access door.

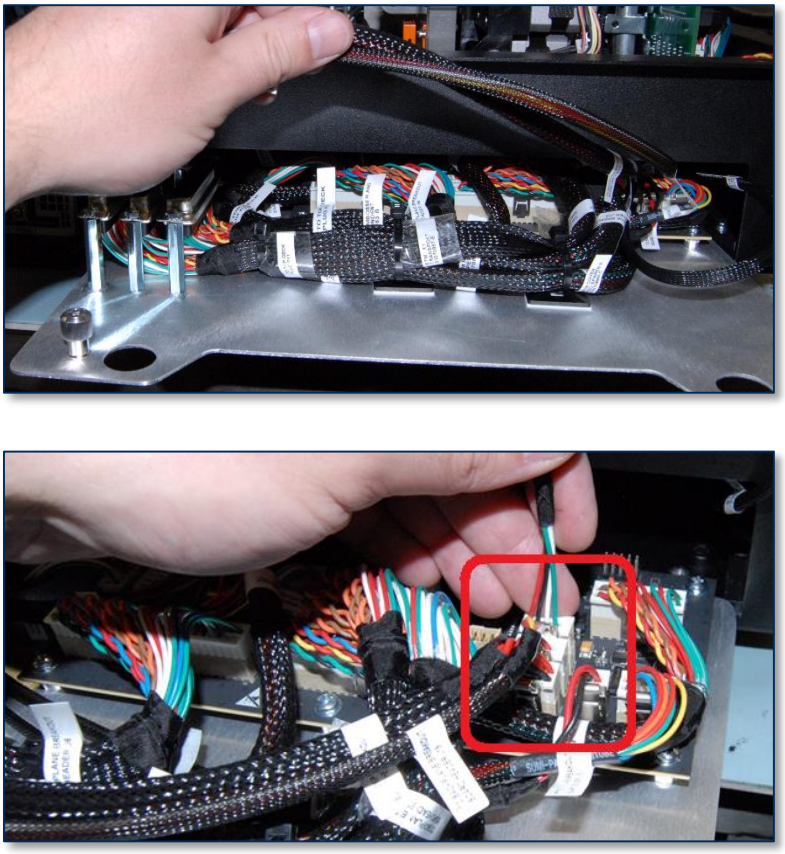


Figure 4-113 - Disconnect Three Cables from Power Controller (LEFT VIEW)

15) Use the finger holes to continue carefully pulling the tray out of the device. Make sure it does not snag on any cables or other parts. Remove it from the device and set it aside in a static-safe location.

To re-install the power controller and backplane, reverse the steps you followed to remove it. Follow these hints to make the re-installation easier:

- Before inserting the tray, re-route the two cables that come off the right end of the tray as shown in **Figure 4-114**, then pull them through the right access door as shown in **Figure 4-115**.
- Before pushing inserting the tray all the way into the left access door, move the two cables you lifted during installation, and route them across the left edge with the other cables as in **Figure 4-116**.

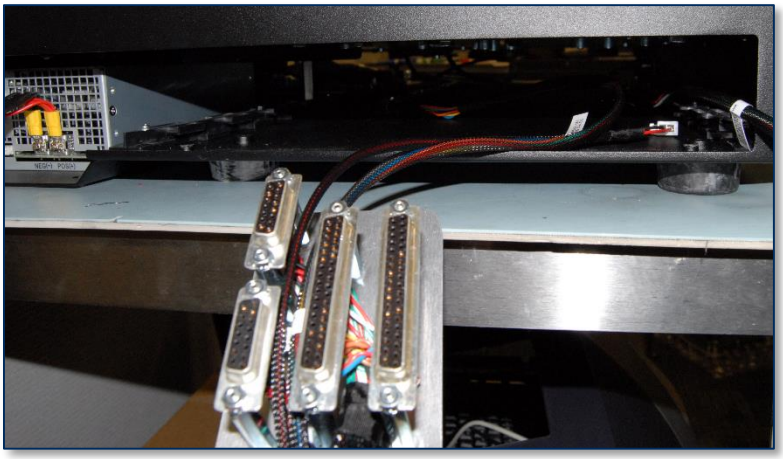


Figure 4-114 - Cable Routing for Inserting Power Controller (LEFT VIEW)

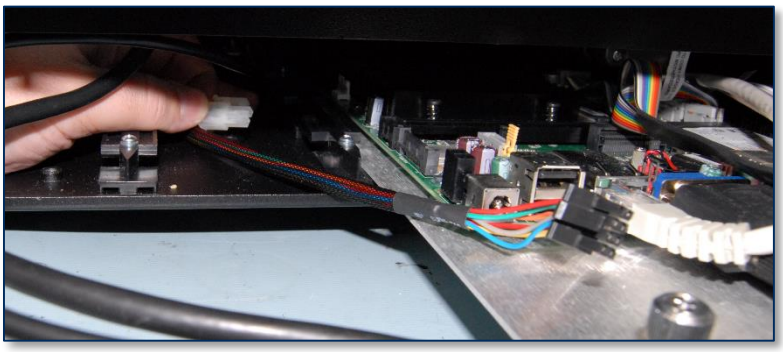


Figure 4-115 - Pulling Power Controller Cables to Right Access Door (RIGHT VIEW)

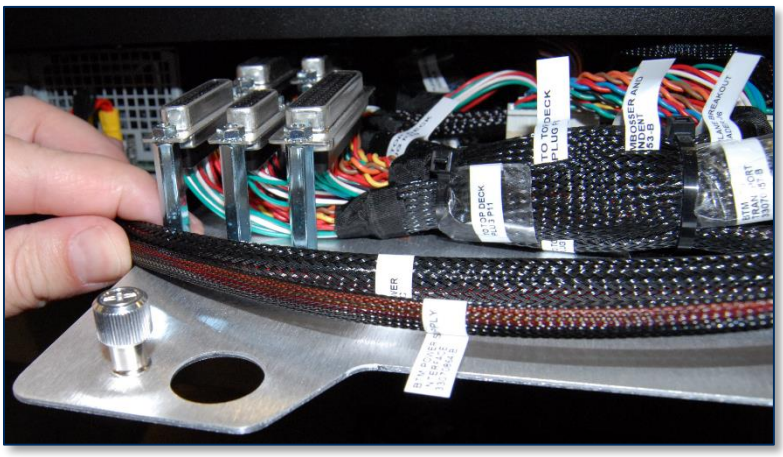


Figure 4-116 - Routing Power Supply Cables Before Final Insertion (LEFT VIEW)

4.19 How to Remove / Re-install the Power Supply

Approximate time to remove: 15 minutes plus any sub-procedures Approximate time to re-install: 15 minutes plus any sub-procedures

The power supply receives AC power from the AC power cord plugged in to the rear of the device, and converts it to the power levels required by the embedded PC, mail logic board, and power controller. It also reports power status and receive power-up and power-down commands from the power controller. It is located in the rear left of the bottom deck of the device.

To remove the power supply, follow these steps:

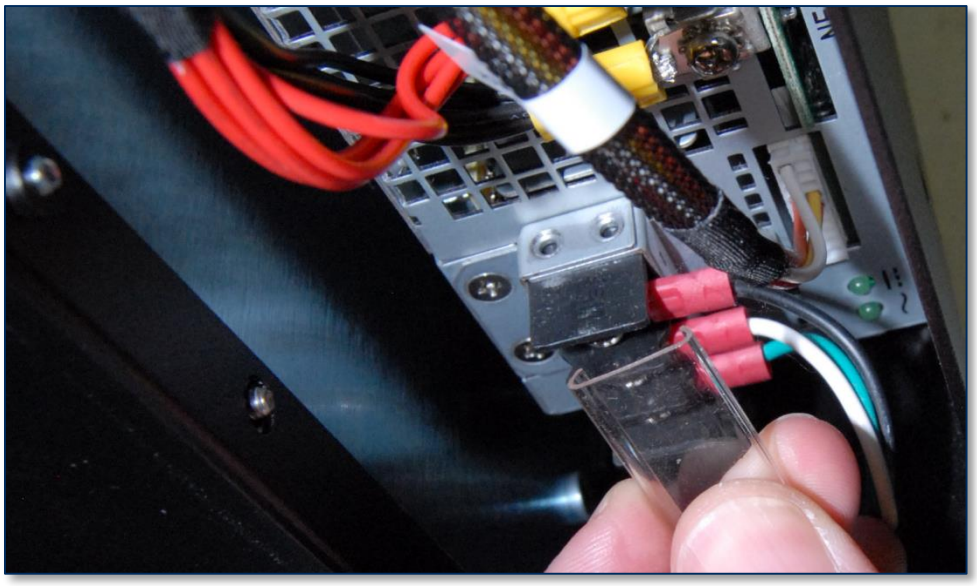
1) Prepare the device for replacing parts by following the steps in section **4.1 How to Prepare the Device for Removing / Re-installing Modules**. At the end, the device should be powered down with all external cables and security hardware safely disconnected.
2) Open the **left** side access door by following the steps in section **4.3 How to Remove / Re-install the Side Access Doors**.
3) Take appropriate steps to protect the work surface the EC2000 is on, paying special attention to the area where the security ring will make contact with the surface in the following step.
4) With a partner, safely and carefully tip the EC2000 onto its rear side to give you access to the bottom of the device, as shown in **Figure 4-117**.

Figure 4-117 - Device Tipped With Rear Side Down (FRONT VIEW)

5) Locate the power supply in the rear of the device behind the left side access door.

Figure 4-118 - Power Supply (LEFT SIDE VIEW)

6) Remove the clear plastic cover that protects the power supply inputs.



7) Use the No. 2 Philips screwdriver to loosen the screws that secure the three power input wires to the power supply, then disconnect the wires.

Figure 4-119 - Power Supply Input Wires (LEFT VIEW)

8) Unplug the white plastic power supply control and monitoring connector shown in **Figure 4-120**.

Figure 4-120 – Power Supply Control and Monitoring Connector (LEFT VIEW)

9) Use the No. 2 Philips screwdriver to loosen the screws holding the power supply output cables, then disconnect the cables. See **Figure 4-121**.

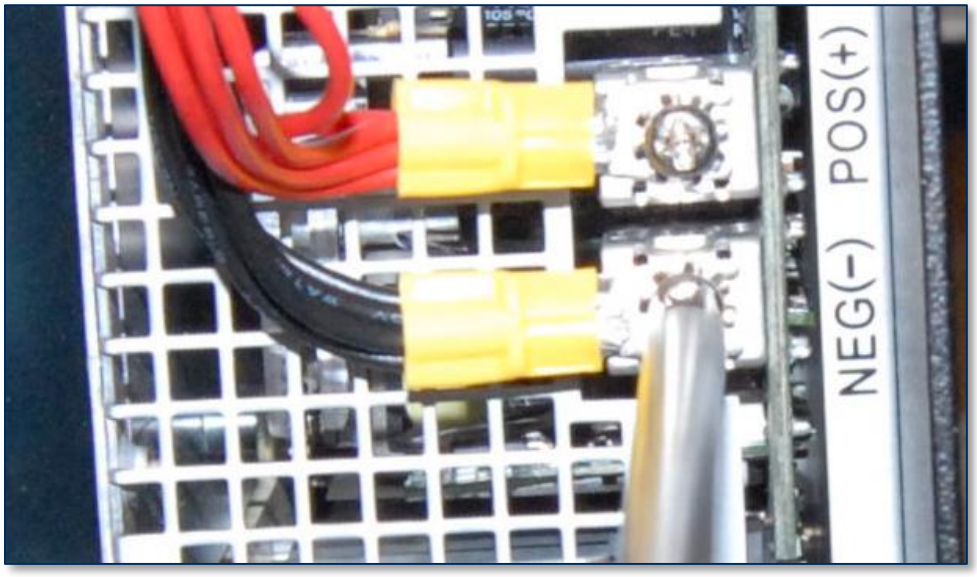


Figure 4-121 - Power Supply Output Cables (LEFT VIEW)

10) While supporting the power supply with one hand, use the No. 2 screwdriver to remove the four screws on the bottom of the device's base that hold the power supply.

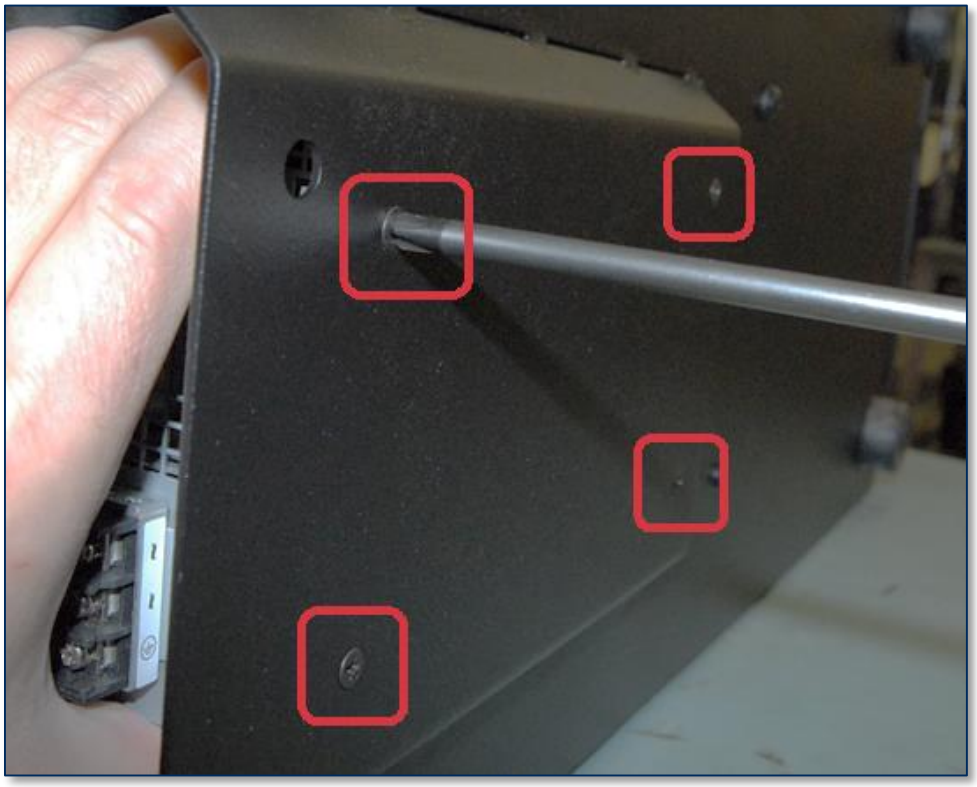
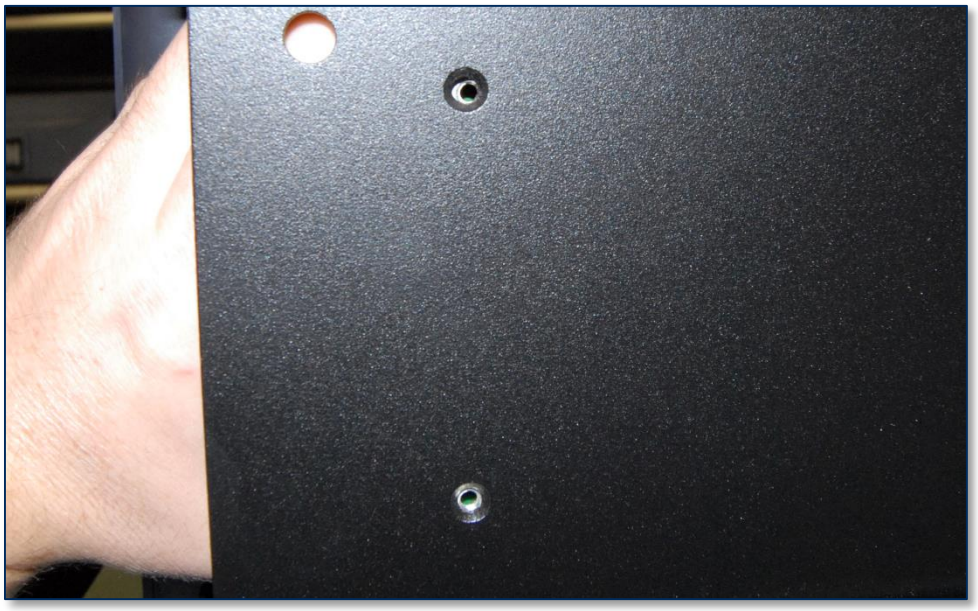


Figure 4-122 - Power Supply Mounting Screws (FRONT LEFT VIEW)

11) Remove the power supply and set it aside.

To re-install the power supply, follow these steps:

1) Put one screw on the tip of the screwdriver, hold the power supply in place with one hand and line up the screw holes, then loosely screw in the first screw to "tack" the power supply in place.



2) Screw in the remaining screws and tighten all of them.
3) Re-connect the output wires according to **Figure 4-121**.
4) Plug in the control and monitoring cable.
5) Re-connect the input wires. Insert the spade connectors **behind the plate behind the screws** (not directly behind the screws, see **Figure 4-119**). The connections are as follows:
   a) The green ground wire goes nearest the floor (toward the rear of the device).
   b) The black wire goes in the middle.
   c) The white wire goes on top (toward the front of the device).
6) Snap the clear plastic cover back in place in front of the input wires.
7) With assistance, carefully tip the device forward to its normal operating position.
8) Replace the left side access door by following the steps in section **4.3 How to Remove / Re-install the Side Access Doors**.
9) Perform any additional service that requires the device to be powered off and open.
10) Re-attach the power cable, network cable, and any security hardware.
11) Power up the device.
12) From the touchscreen, navigate to **Menu** > **Samples**, create a sample card, and make sure the device functions properly and the sample looks correct. If the device does not power up or function properly, contact MagTek Support Services (see **Appendix A Technical Support**).

4.20 How to Remove / Re-install the Magnetic Stripe Reader (MSR) Module

Approximate time to remove: 5 minutes plus any sub-procedures Approximate time to re-install: 15 minutes plus any sub-procedures

The magnetic stripe reader (MSR) provides device operators a way to swipe cards with magnetic stripes and transmit the card's data to the embedded PC. It is located in the slot at the top front center of the device, just above the MagTek logo.

To remove the magnetic stripe reader, follow these steps:

1) Prepare the device for replacing parts by following the steps in section **4.1 How to Prepare the Device for Removing / Re-installing Modules**. At the end, the device should be powered down with all external cables safely disconnected.
2) Open the top access door by following the steps in section **2.7 How to Open the Top Access Door**.
3) Locate the magnetic stripe reader module behind the curve at the top front of the cover.
4) Open the image printer to make room for the screwdriver you will use in the next step.
5) Use the No. 1 Philips screwdriver to remove the right and middle screws securing the MSR to the cover. Note the screws are installed at a slight downward angle. See **Figure 4-123**.

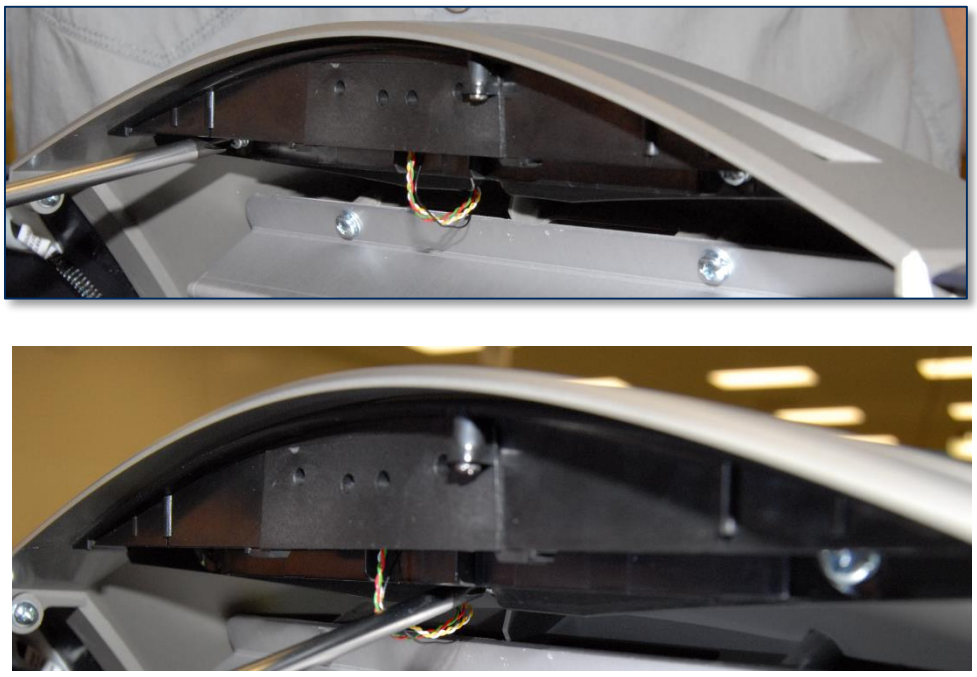


Figure 4-123 - Magnetic Stripe Reader Screws (REAR LEFT VIEW)

6) Close the image printer and remove the left and final screw securing the MSR to the cover.
7) If the MSR cable is tied or clipped to the front of the cover, untie or unclip it. Leave any ties or clips on the top deck plate in place.
8) Pull the MSR out of the cover and disconnect its cable.
9) Set the MSR aside.

To re-install the magnetic stripe reader (MSR), follow these steps:

1) Re-connect the MSR cable.
2) Press the MSR back in place (see **Figure 4-123**).
3) Open the image printer to make room for the screwdriver you will use in the next step.
4) Use the No. 1 Philips screwdriver to re-insert and tighten the right and middle screws.
5) Close the image printer and re-insert and tighten the left and final screw.
6) Re-clip or re-tie the MSR cable to the cover.
7) Perform any other service that requires the device to be powered off and open.
8) Close the top access door.
9) Power up the device.
10) Test the device.

Note, the other end of the MSR cable connects to the embedded PC at the location shown in **Figure 4-124** (see section **4.15 How to Remove / Re-install the Embedded PC** for more information about the embedded PC). You should not have to replace the cable during standard MSR replacement.

Figure 4-124 - Magnetic Stripe Reader Connector to Embedded PC (TOP VIEW FROM REAR)

4.21 How to Remove / Re-install the Touchscreen

Approximate time to remove: 5 minutes plus any sub-procedures Approximate time to re-install: 5 minutes plus any sub-procedures

The touchscreen presents device operators and service personnel with a graphical user interface. It has a bidirectional data connection with the embedded PC, which transmits video for display and receives mouse commands when a user presses on the screen. It is mounted to the front center of the cover.

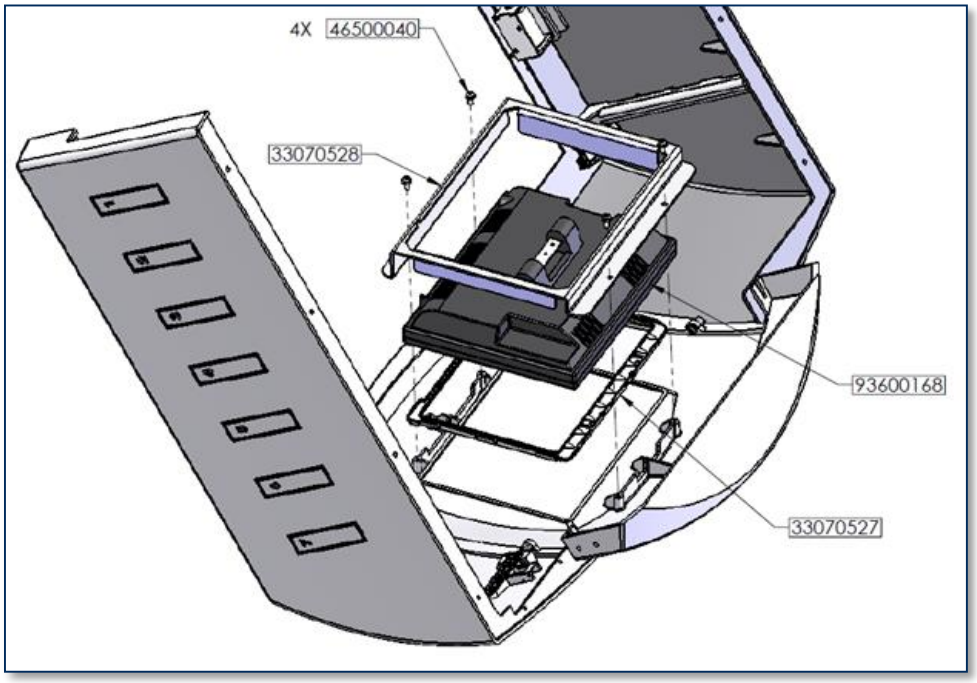
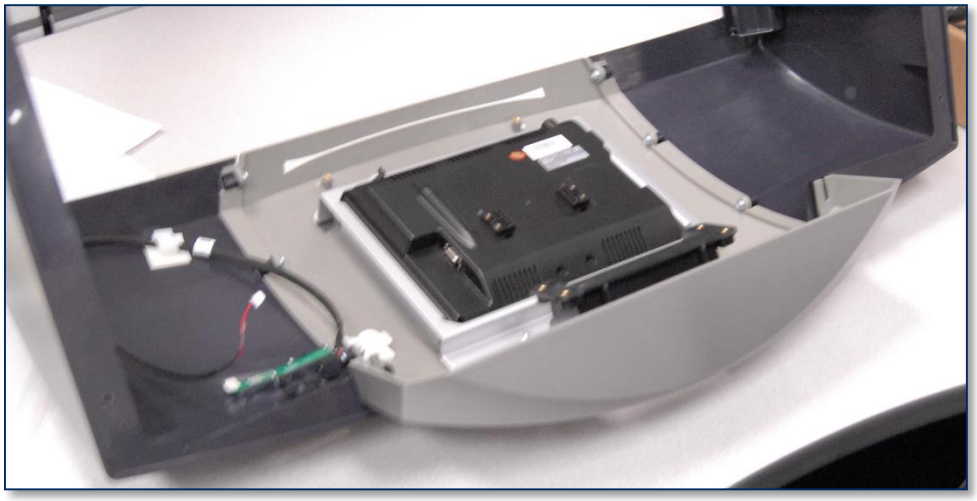


Figure 4-125 – Cover and Touchscreen (REAR RIGHT VIEW, ROTATED)

To remove the touchscreen, follow these steps:

1) If you are replacing any modules that do NOT require silicone adhesive, replace those first. That will reduce the risk of breaking the touchscreen's adhesive during other service.
2) Prepare the device for replacing parts by following the steps in section **4.1 How to Prepare the Device for Removing / Re-installing Modules**. At the end, the device should be powered down with all external cables safely disconnected.
3) Remove the cover by following the steps in section **4.4 How to Remove / Re-install the Cover**.
4) Place the cover on a protected surface with the touchscreen toward the floor.



5) Remove the four screws that secure the touchscreen retaining plate to the cover (see **Figure 4-126**) and set them aside.

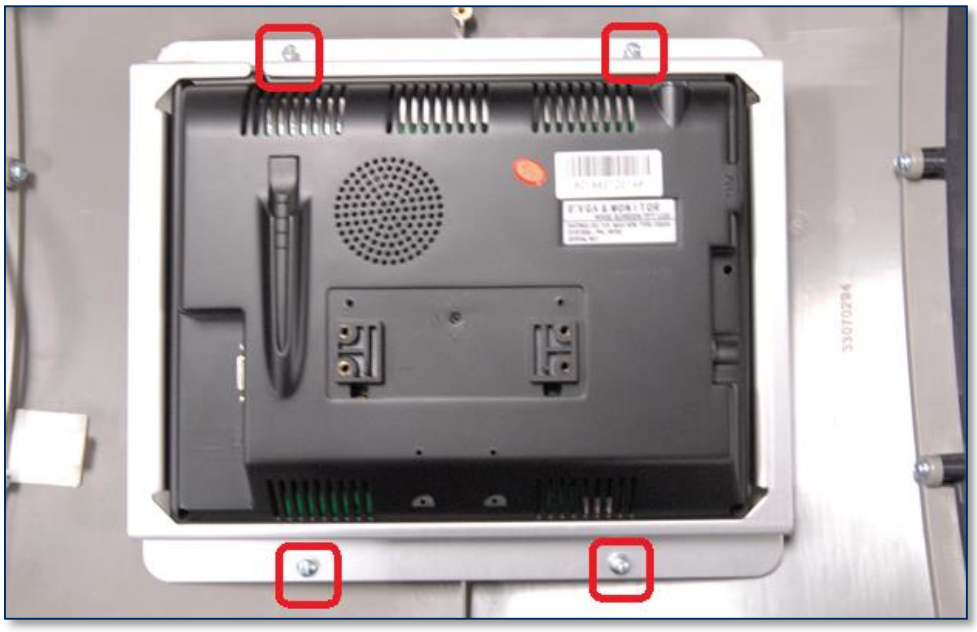


Figure 4-126 - Touchscreen Retaining Plate Screws (REAR VIEW)

6) Remove the touchscreen retaining plate and set it aside.
7) Remove the touchscreen and set it aside.

To re-install the touchscreen, follow these steps:

1) Place the cover on a protected surface with the front touchscreen opening toward the floor.
2) Put the touchscreen in place.
3) Put the touchscreen retaining plate over the touchscreen so the screw holes line up with the screw holes in the cover.
4) Use the No. 2 Philips screwdriver to insert and tighten the screws.
5) Perform any other service that requires the cover to be removed.
6) Re-install the cover by following the steps in section **4.4 How to Remove / Re-install the Cover**.
7) Remember to secure the touchscreen cables with silicone as shown in **Figure 4-127**.

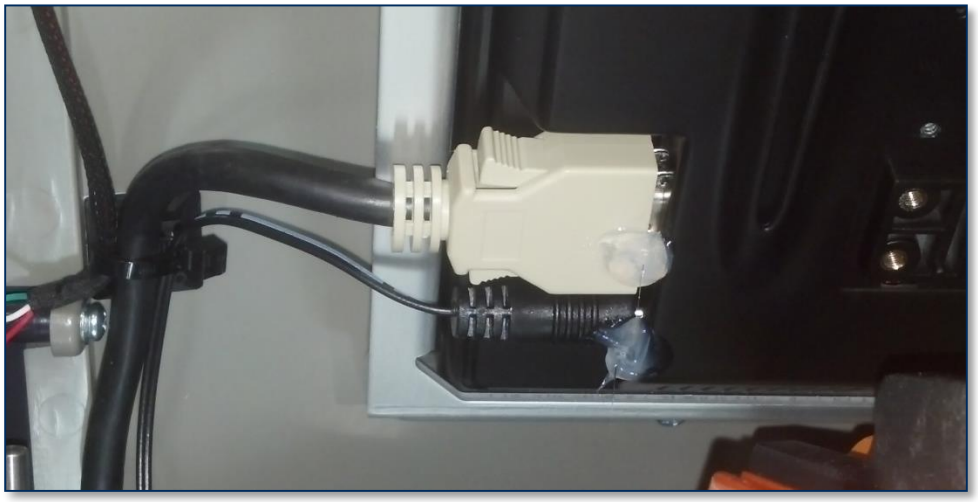


Figure 4-127 - Silicone Adhesive On Touchscreen Connectors (REAR VIEW)

8) Perform any other service that requires the device to be powered down and open.
9) Close the top access door.
10) Re-connect the power cable, network cable, and any security hardware.
11) Power up the device.
12) Use the touchscreen to navigate through several menus to make sure it functions properly.
13) Perform any relevant adjustments from section **5 Adjustments**, notably section **5.1 How to Calibrate the Touchscreen**.

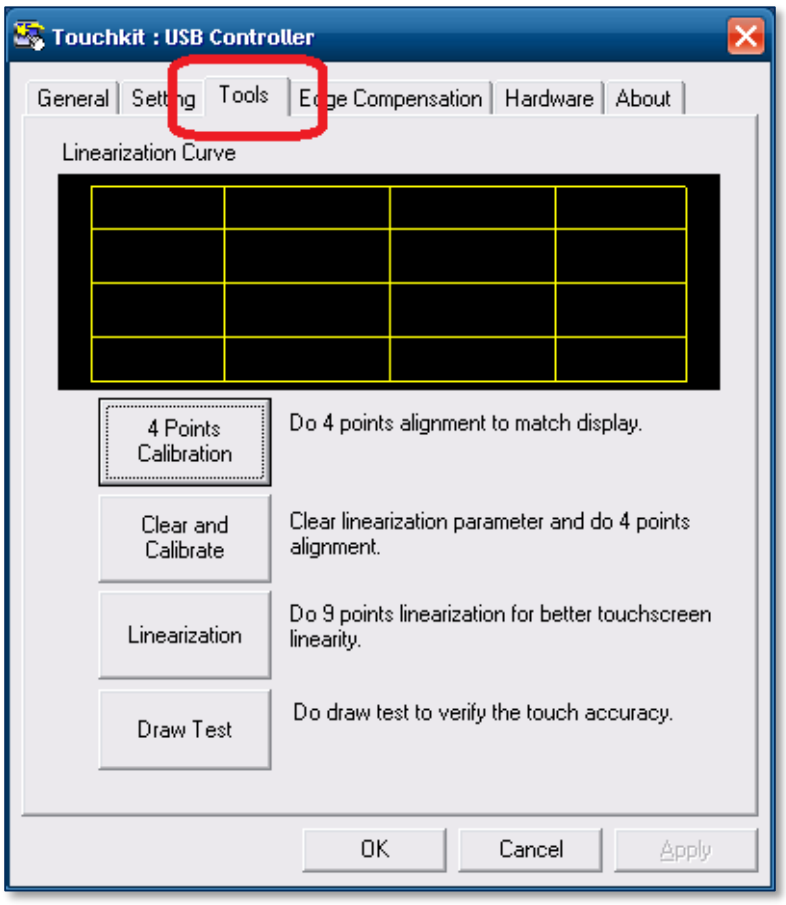
5 Adjustments

During scheduled maintenance or after replacing a module, testing may reveal that the settings for one or more of the modules in the EC2000 need to be adjusted. **This section is intended to be used as a reference only when needed,** and provides step-by-step instructions for adjusting calibration settings.

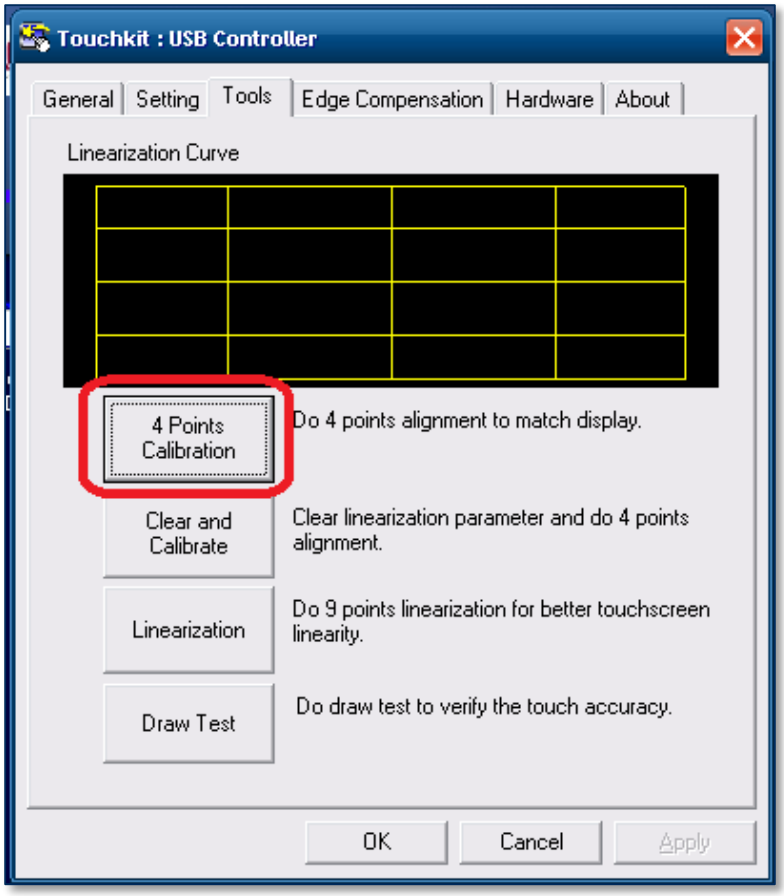
5.1 How to Calibrate the Touchscreen

If finger presses on the touchscreen are registering in the wrong place (for example, after replacing the touchscreen), follow these steps:

1) Contact MagTek Support Services for assistance signing in to the device as an administrator and accessing the Windows desktop.
2) **Stand** in front of the device (do not sit), because calibration depends on your viewing angle and most of our users will be standing in front of the device on a countertop.
3) From the touchscreen's Windows desktop, open the **Tools** shortcut.
4) From the Tools folder, launch the **Touchkit** shortcut to open the **Touchkit : USB Controller** window.
5) Select the **Tools** tab.



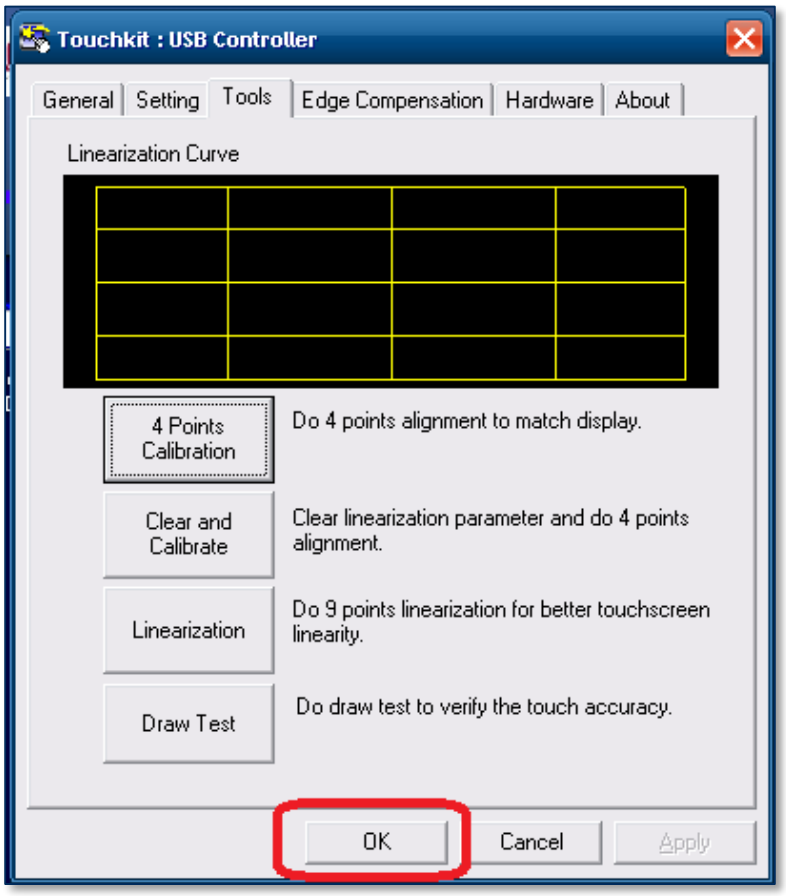
6) Press the **4 Points Calibration** button.



7) **Press and hold** the center of the X on the screen until it stops flashing and turns solid blue.

8) **Repeat** for all Xes that appear on the screen until the system reports "4 points calibration completed. Press[Ok] to continue."
9) Press the **OK** button to dismiss the popup window.

10) Press the **OK** button at the bottom of the **Touchkit : USB Controller** window to close it.



5.2 How to Calibrate the Hopper Transport Module

The Hopper Transport keeps several settings that tell it how far to go when it moves from one place to another. If the Hopper Transport needs to be adjusted, follow the steps in this section.

5.2.1 How to Calibrate Hopper Transport Home to Printer Handoff

To calibrate the Y position of the Hopper Transport during handoff to the printer (from hopper 1), follow these steps:

1) Remove **hopper 2** and **hopper 3** from the EC2000 and set them aside.
2) From the ExpressCard 2000 Utility, navigate to **Menu** > **Settings** > **Service** > **MCP Commands** to open the **Controller Commands** page.
3) Press the **Shuttle Home** button.
4) In the dropdown list next to the "To Hopper" button, select Hopper **1**.
5) Press the **To Hopper** button.
6) Press the **Push to Roller** button.
7) Press the **Shuttle to Printer** button.
8) Check to make sure the card is centered at the opening of the image printer.
9) If the card **is centered** at the printer opening, press the **Roll to Printer** button.

10) If the card is **not centered** at the printer opening **or** if it hit either side of the printer opening **or** if the card skewed to one side when entering the printer:
    a) Pull on the triangular belt on the front side of the hopper transport to back the card out of the hopper transport, and remove the card.
    b) Navigate to **Menu** > **Settings** > **Edit Config.** to open the **Configuration Editing** password page.
    c) Enter password **1234567**, then press the **E** button.
    d) Enter password **7654321**, then press the **E** button to open the **Configuration Editing** page.
    e) Scroll through the list of options to find the **ShuttleHomeToPrinterHandoff** setting, and select the number beneath it to bring up the on-screen keypad.
    f) If hopper transport was too far toward the **rear** of the EC2000, **increase** the setting, press the **Save** button, and to back to the beginning of this section.
    g) If hopper transport was too far toward the **front** of the EC2000, **decrease** the setting, press the **Save** button, and go back to the beginning of this section.
11) Press the **Printer Eject** button.
12) Remove the card from the image printer exit and recycle it.

5.2.2 How to Calibrate Hopper Transport Manual Feed Slot to Printer Handoff

To calibrate the Y position of the Hopper Transport during handoff to the printer (from the manual feed slot), follow these steps

1) Make sure **hopper 2** and **hopper 3** are removed from the EC2000.
2) From the ExpressCard 2000 Utility, navigate to **Menu** > **Settings** > **Service** > **MCP Commands** to open the **Controller Commands** page.
3) Press the **Shuttle Home** button.
4) Press the **To Manual Feed** button.
5) Insert a blank card into the manual feed slot with its magstripe facing down and to the right. The slot will not automatically take the card.
6) Press the **Roller Consume** button.
7) Press the **Shuttle to Printer** button.
8) Check to make sure the card is centered at the opening of the image printer.
9) If the card **is centered** at the printer opening, press the **Roll to Printer** button.
10) If the card is **not centered** at the printer opening **or** if it hit either side of the printer opening **or** if the card skewed to one side when entering the printer:
    a) Pull on the triangular belt on the front side of the hopper transport to back the card out of the hopper transport, and remove the card.
    b) Navigate to **Menu** > **Settings** > **Edit Config.** to open the **Configuration Editing** password page.
    c) Enter password **1234567**, then press the **E** button.
    d) Enter password **7654321**, then press the **E** button to open the **Configuration Editing** page.
    e) Scroll through the list of options to find the **ShuttleHomeToExceptionFeed** setting, and select the number beneath it to bring up the on-screen keypad.
    f) If hopper transport was too far toward the **rear** of the EC2000, **decrease** the setting, press the **Save** button, and to back to the beginning of this section.

g) If hopper transport was too far toward the **front** of the EC2000, **increase** the setting, press the **Save** button, and go back to the beginning of this section.

11) Press the **Printer Eject** button.
12) Remove the card from the image printer exit and recycle it.
13) Re-install **hopper 2** and **hopper 3** in the device.
14) Press the **Status** button to return to the **Status** page.

5.3 How to Calibrate the XY Transport Module

5.3.1 About Calibrating the XY Transport

There are two parameters that must be calibrated to make sure cards are properly handed off from the image printer to the XY transport. Each setting represents the number of steps the XY motors should take to get to the specified location.

- One setting tells the image printer how far to push cards out from its exit (the X direction).
- One setting tells the XY transport how far toward the front or rear of the device (the Y direction) it should park to take cards from the image printer. The XY transport should be far enough forward that cards coming out of the image printer slide into its card clamp and push the spring-loaded rail (the "justifier") at the printer exit a short distance (0.04" to 0.06") toward the front of the device. This pressure allows the justifier to straighten the card against the XY transport's card clamp.

If the XY transport needs to be calibrated, follow the steps in this section.

5.3.2 How to Calibrate Printer to XY Transport Handoff

To calibrate where the XY transport goes to take a card from the printer, follow these steps:

1) Navigate to **Menu** > **Settings** > **Service** > **MCP Commands** to open the **Controller Commands** page.
2) Press the **Pusher Home** button.
3) Press the **Shuttle Home** button.
4) Next to the "To Hopper" button, select **1** from the list and press the **To Hopper** button.
5) Press the **Push To Roller** button.
6) Press the **Shuttle To Printer** button.
7) Press the **XY Home** button.
8) Press the **XY To Printer** button.
9) Press the **XY To Printer In** button.
10) Press the **Unclamp Card** button.
11) Press the **Roll To Printer** button.
12) Press the **Printer Eject** button.
13) Press the **Clamp Card** button.
14) Make sure the card reaches far enough out of the printer that sticks out just past the second metal block on the card clamp assembly (both metal blocks are circled in **Figure 5-1**).
15) Make sure the card touches the back of the black plastic part of the card clamp all along the line shown in **Figure 5-1**.
16) Make sure the card is pushed far enough toward the front of the device that it pushes on and raises the metal justifier flag next to the printer exit (even just a little bit is OK).

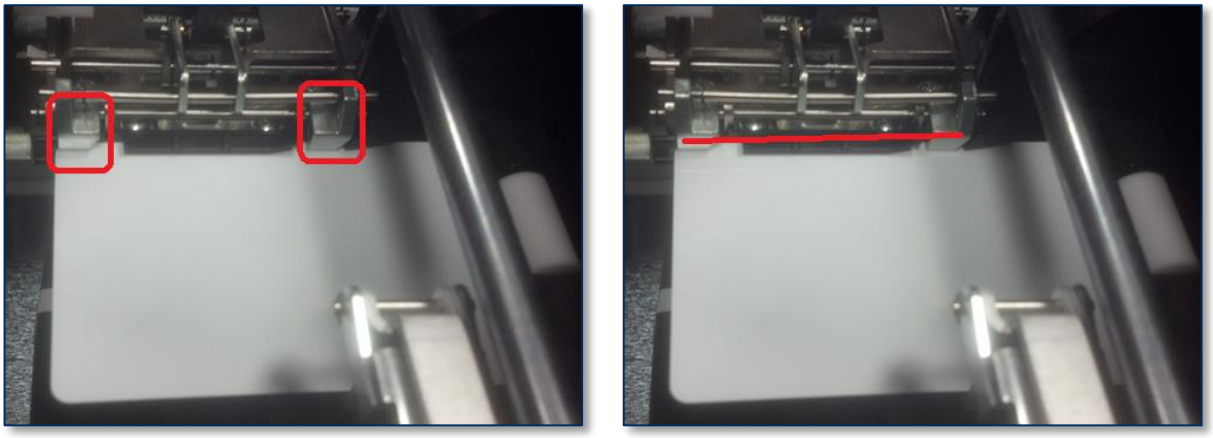


Figure 5-1 - Card Clamps On Card (FRONT VIEW)

17) If the card doesn't fit all these conditions, adjust the handoff location by following these steps:
    a) Navigate to **Menu** > **Settings** > **Edit Config** to open the first **Configuration Editing** password page.
    b) Enter password **1234567** and press the **E** button to open the second password page.
    c) Enter password **7654321** to open the **Configuration Editing** page.
    d) Scroll down in the list of settings until you find the **PrinterHandoffAdjustmentX** setting.
    e) If the card did not push far enough toward the second clamp, **decrease** the **PrinterHandoffAdjustmentX** setting by selecting the number in the list, pressing the **C** button, then entering the new number on the on-screen keypad and pressing the **E** button.
    f) If the card did not make contact with the plastic portion of the clamp or did not press on the justifier and raise it a little bit, **decrease** the **PrinterHandoffAdjustmentY** setting by clicking the number in the list, pressing the **C** button, then entering the new number on the on-screen keypad and pressing the **E** button.
    g) Press the **Save** button to save your changes.
    h) Repeat the steps in this section until the card clamps correctly when it exits the printer. **Keep the card in the XY Transport for the next section**.

5.3.3 How to Calibrate XY Transport to Exit Transport Handoff

To calibrate where the XY Transport goes to push a card into the exit rollers, follow these steps:

1) Make sure you have moved a card to the XY Transport as described in the previous section.
2) Navigate to **Menu** > **Settings** > **Service** > **MCP Commands** to open the **Controller Commands** page.
3) Press the **XY To Embosser** button.
4) Press the **XY To Exit** button.
5) Make sure the XY Transport does not bump against the Exit Transport.
6) Make sure the first green roller on the exit ramp is centered on the card.
7) Make sure the card is pushed into the exit ramp past the point where the first green roller touches it.
8) If the card doesn't fit all three of these conditions, adjust the handoff location by following these steps:
    a) Navigate to **Menu** > **Settings** > **Edit Config** to open the first **Configuration Editing** password page.

b) Enter password **1234567** and press the **E** button to open the second password page.

c) Enter password **7654321** to open the **Configuration Editing** page.

d) Scroll down in the list of settings until you find the **ExitHandoffAdjustmentX** setting.

e) If the XY Transport bumped into the Exit Transport, **decrease** the **ExitHandoffAdjustmentX** setting by selecting the number in the list, pressing the **C** button, then entering the new number on the on-screen keypad and pressing the **E** button. Adjust about 10 steps at a time.

f) If the card did not push far enough into the exit ramp, **increase** the **ExitHandoffAdjustmentX** setting by selecting the number in the list, pressing the **C** button, then entering the new number on the on-screen keypad and pressing the **E** button. Adjust about 10 steps at a time.

g) If the card is off-center from the green roller and is too close to the **front** of the EC2000, **increase** the **ExitHandoffAdjustmentY** setting by clicking the number in the list, pressing the **C** button, then entering the new number on the on-screen keypad and pressing the **E** button. Adjust about 10 steps at a time.

h) If the card is off-center from the green roller and is too close to the **back** of the EC2000, **decrease** the **ExitHandoffAdjustmentY** setting by clicking the number in the list, pressing the **C** button, then entering the new number on the on-screen keypad and pressing the **E** button. Adjust about 10 steps at a time.

i) Press the **Save** button to save your changes.

j) Repeat these steps from step 1 until the card clamps correctly when it exits the printer.

9) Navigate to **Menu** > **Settings** > **Service** > **MCP Commands** to open the **Controller Commands** page.

10) Press the **Unclamp Card** button to release the card.

11) Press the **Exit Eject** button to eject the card into the card output hopper.

12) Press the **Status** button to return to the Status page.

5.4 How to Calibrate the Embosser Module

5.4.1 About Embosser Calibration

The EC2000 embosser squeezes cards between two "knuckles." Each knuckle can be adjusted higher or lower to make sure embossed characters are being pressed deeply enough into the card, and to make sure the card is being squeezed evenly on both sides (see **Figure 5-2**).

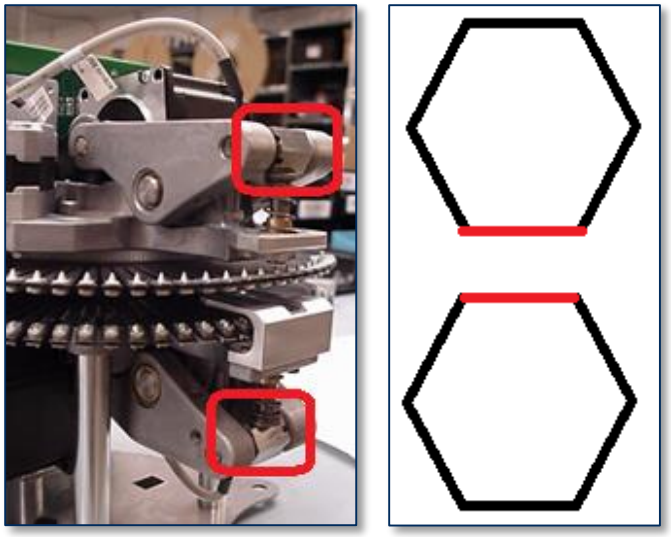


Figure 5-2 –Embosser Knuckles (REAR LEFT VIEW and PROFILE VIEW)

Each knuckle can be rotated to point one of its six faces toward the card being embossed. Each face presses to a different depth. **+3 is the highest pressure setting**, and **-3 is the lowest pressure setting**. You can read the current depth by looking at the shape carved into the side of the knuckle that faces the card (see **Figure 5-3**).

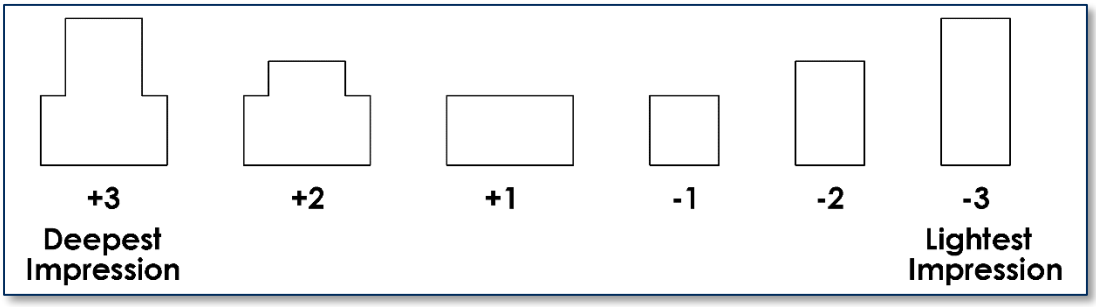


Figure 5-3 - Embosser Knuckle Heights Key (+3 = Most Pressure, -3 = Least Pressure)

Embossers should have ink marks indicating factory-calibrated positions for the top and bottom knuckle as shown in **Figure 5-4**.

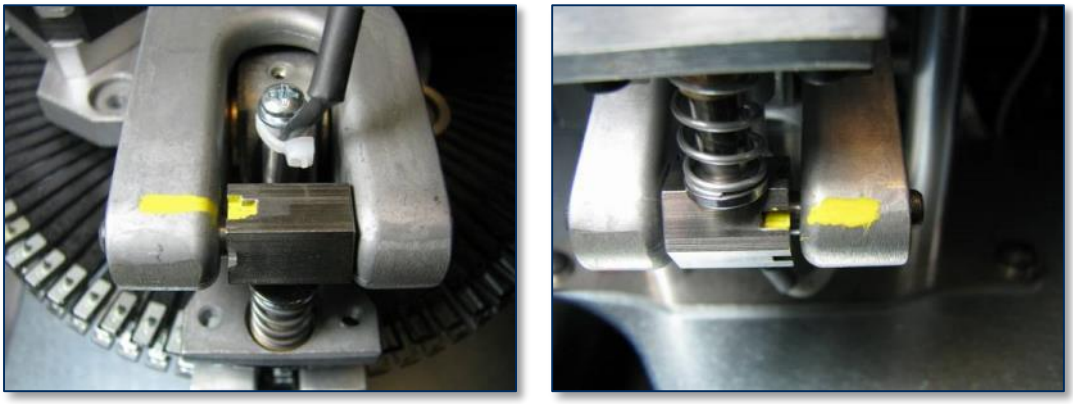


Figure 5-4 - Marking Factory Default Knuckle Position (REAR VIEW)

The embosser can also be calibrated using **CamAngle** settings in the software. A label on the base of the embosser should show the factory default settings for the embosser knuckles and for the CamAngle settings, as shown in **Figure 5-5**.

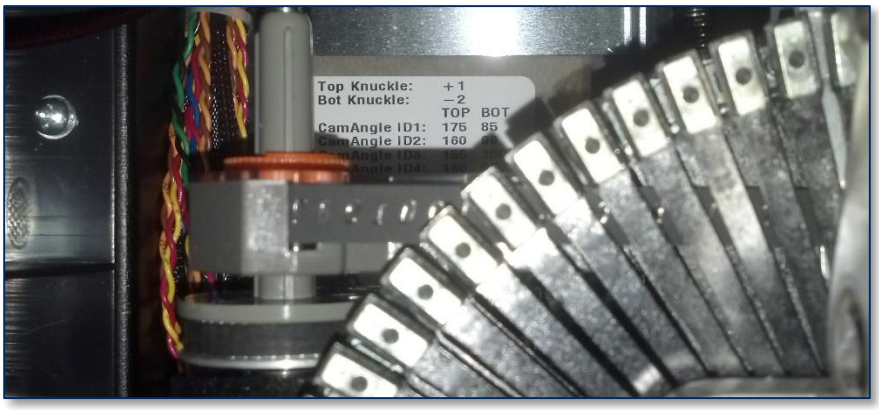


Figure 5-5 - Factory Default Knuckle and CamAngle Settings (TOP VIEW FROM FRONT)

Many of the following sections require you to create a tuning card, then measure the thickness of its embossed characters. Section **5.4.3 How to Measure Embossed Character Thickness** provides step-by-step instructions.

5.4.2 How to Calibrate the Embosser Wheel Home Position

To make sure the motor controller accurately centers the embosser wheel in the embosser bridge opening, follow these steps:

1) Close the EC2000 top access door to make sure no light will interfere with the sensor.
2) In the ExpressCard 2000 Utility, Navigate to **Menu** > **Settings** > **Service** > **MCP Commands** to open the **Controller Commands** page.
3) Press **Calibrate Wheel Home** button and wait for 10 seconds until the embosser stops moving. The system will fill in a value below **Calibrate Wheel Home**.

4) Repeat the **Calibrate Wheel Home** operation several times until you see the same number three times in a row. If the number continues to change after 10 tests, report the unit's failure to calibrate.
5) Check that the value below **Calibrate Wheel Home** is **between 4 and 10**. If the value is not in that range, report the unit's failure to calibrate within the acceptable range.

6) After successfully calibrating, press the **Save** button to save the new embosser wheel center value.
7) Press the **OK** button to dismiss the popup window confirming it has been saved.
8) Open the top access door and inspect the embosser tine position to make sure the currently selected tine is centered in the embosser bridge opening.
9) Press the **Status** button to return to the **Status** page.

5.4.3 How to Measure Embossed Character Thickness

Figure 5-6 - Measuring Embossed Character Height

When the sections below call for creating and measuring a tuning card, follow these steps:

1) From the touchscreen, navigate to **Menu** > **Settings** > **Tuning** to open the **Tuning (Move Embossing)** page.
2) Press the **Print** button. The EC2000 will create a tuning card and drop it in the card output hopper.
3) Insert a blank portion of the card into the calipers and gently tighten the knob.
4) Press the **ZERO** button or equivalent to reset the "zero point" of the calipers to the card thickness.
5) Loosen the calipers and move it to the embossed characters you want to measure.

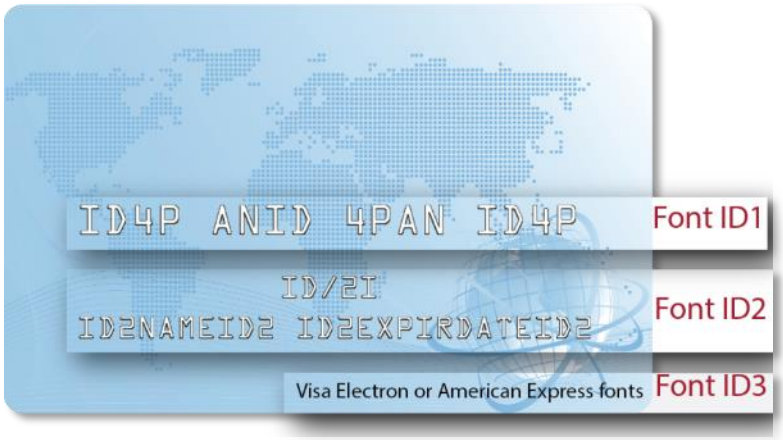


Figure 5-7 - Font IDs

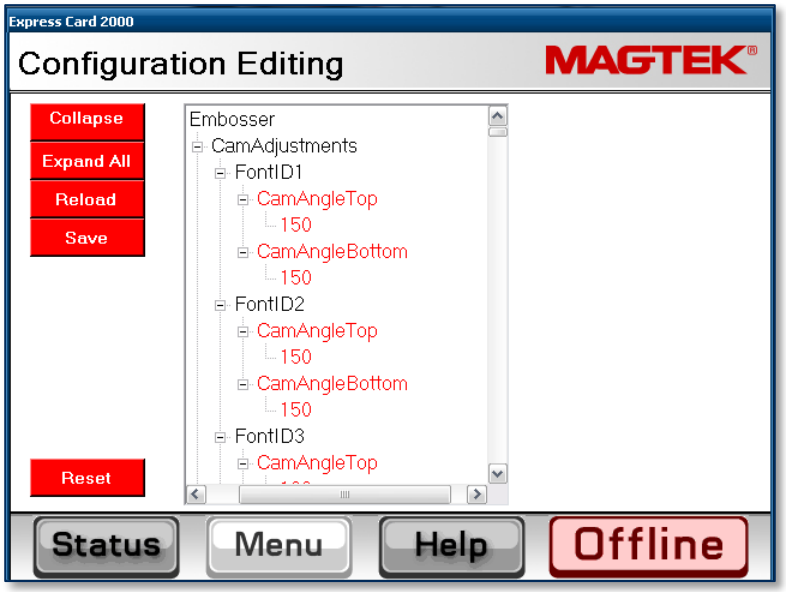
6) Gently tighten the calipers and read the thickness of embossed characters.
7) Take a couple measurements of different characters in the same font set and note the **highest** and **lowest** values for each font.

5.4.4 How to Pre-Set Embosser Defaults

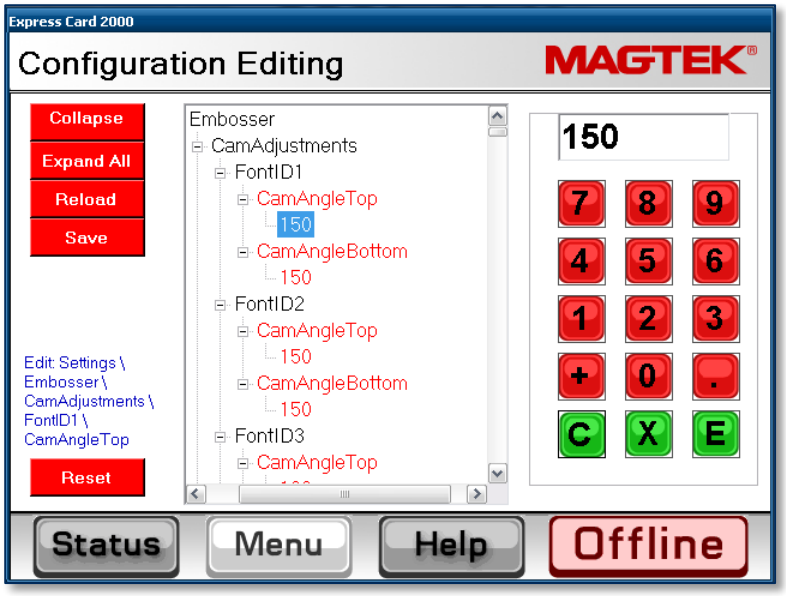
The embosser is designed to turn its cam by at least a certain angle to work properly. In cases where you do not already have a starting point to calibrate the embosser, set the embosser to its minimum CamAngle setting for all fonts, and to "light" knuckle settings by doing the following:

1) Open the top access door.

2) Check to see if the embosser has a yellow mark across its knuckles and rocker arm. If it has been marked, set the knuckles to those settings. Otherwise, set the knuckles to "light" defaults:
   a) Set the bottom surface of the **top knuckle** to **-2**. It may be helpful to turn the knuckle 3 clicks to read the setting, then turn it back.
   b) Set the top surface of the **bottom knuckle** to **+1**. It may be helpful to turn the knuckle 1 click to read the setting, then turn it back.
3) Check to see if the embosser has a sticker on its base saying what top and bottom embosser cam angle settings to use as defaults. If it has a sticker, use those settings in the following steps; otherwise, set the top and bottom embosser cam angle for FontID1, 2, and 4 to **160** and FontID3 to **110** as follows:
   a) In the ExpressCard Utility, navigate to **Menu** > **Settings** > **Edit Config** to open the **Configuration Editing** password page.
   b) Enter password **1234567**, then **7654321** to open the **Configuration Editing** page.
   c) Scroll to the **Embosser > CamAdjustments** section.



   d) Repeat these steps for the **FontID1 CamAngleTop**, **FontID1 CamAngleBottom**, **FontID2 CamAngleTop**, **FontID2 CamAngleBottom**, **FontID4 CamAngleTop**, and **FontID4 CamAngleBottom** (6 settings total):
      i) Select the number below the name of the value. A keypad will appear on the right side of the screen.



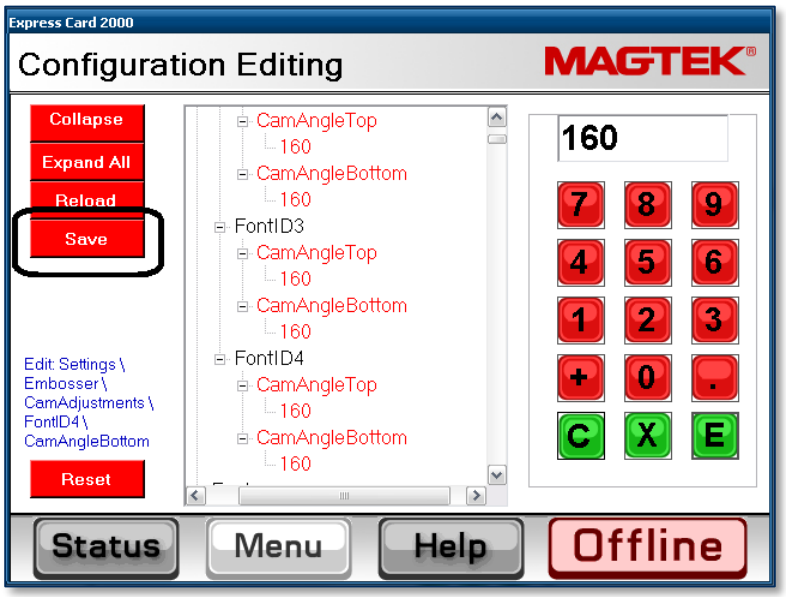
ii) Press the **C** button to clear it the value above the keypad to "0."

iii) Enter **160** on the keypad, then press the **E** button to change the setting.

iv) Repeat these steps for the next setting until you finish with **FontID4, CamAngleBottom**.

e) Repeat the steps above to set **FontID3 CamAngleTop** and **FontID3 CamAngleBottom** to **110**.

f) Press the **Save** button to save all changes.



4) Press the **OK** button to dismiss the popup confirming the values have been saved.

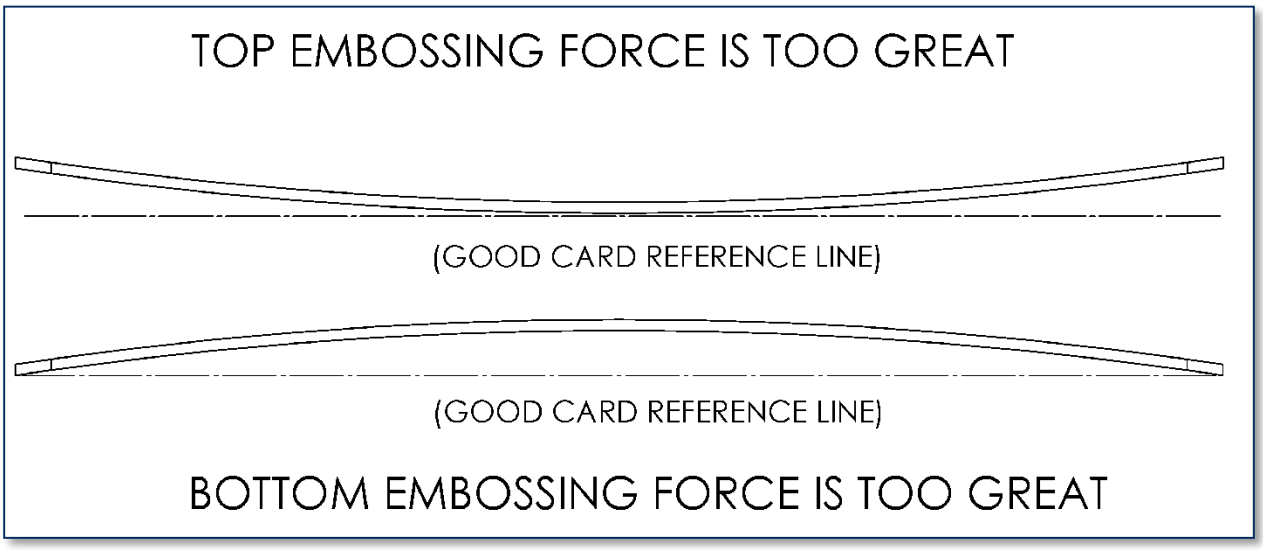
5.4.5 How to Set Minimum Thickness Using CamAngle

The embosser must produce a minimum thickness before it makes sense to use knuckle adjustments to change thickness and bending of a card. To make sure the embosser is reaching that minimum character thickness, follow these steps:

1) Create and measure a tuning card.

2) If the embossed character thickness is between **0.017 in.** and **0.019 in.** and the card is flat, skip to section **5.4.7 How to Fine-Tune Embossed Character Height** Using Software.
3) If the lowest **FontID1** thickness you measured is **less than 0.0120 in.**:
   a) In the ExpressCard 2000 Utility, navigate to **Menu** > **Settings** > **Edit Config** to open the **Configuration Editing** password page.
   b) Use the onscreen keypad to enter password **1234567** and press the **E** key.
   c) Use the onscreen keypad to enter password **7654321** and press the **E** key.
   d) Scroll through the settings list to find **FontID1 CamAngleTop** and **FontID1 CamAngleBottom**.
   e) Select **FontID1 > CamAngleTop**, add 10 to the current setting, enter the new value in the text entry box at the top right of the screen, and press the **E** key.
   f) Select **FontID1 > CamAngleBottom**, add 10 to the current setting, enter the new value in the text entry box at the top right of the screen, and press the **E** key.
   g) Press the **Save** button to save the new settings.
   h) Repeat all steps in section **5.4.5**.
4) If the highest **FontID1** thickness you measured is **less than 0.0170 in.**:
   a) If the card is bent **concave down** ("frowning"), increase the pressure of the top knuckle by **adding 1** to the current setting (see **Figure 5-3**).
   b) If the card is bent **concave up** ("smiling"), increase the pressure of the bottom knuckle by **adding 1** to the current setting (see **Figure 5-3**).
   c) Repeat all steps in section **5.4.5**.
5) If the highest FontID1 thickness you measured is **higher than 0.0190 in.**:
   a) If the card is bent **concave up** ("smiling") decrease the pressure of the top knuckle by **subtracting 1** from the current setting (see **Figure 5-3**).
   b) If the card is bent **concave down** ("frowning"), decrease the pressure of the bottom knuckle by **subtracting 1** from the current setting (see **Figure 5-3**).
   c) Repeat all steps in section **5.4.5**.
6) Repeat section **5.4.5** for **FontID2**.

5.4.6 How to Calibrate Card Flatness



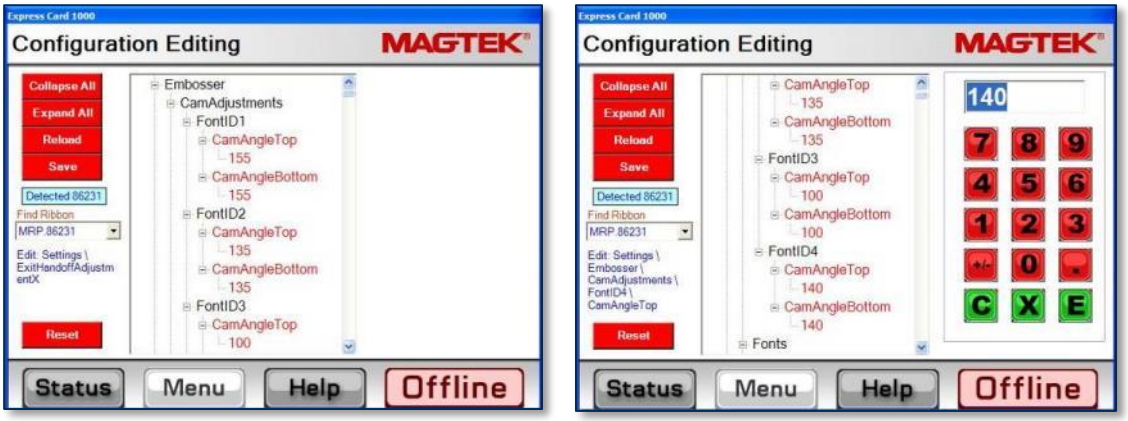
After calibrating thickness, there still may be some bending in the card. Eliminate bending as much as possible by following these steps:

1) Place the latest tuning card on a flat table and look at it from the side. A very small amount of **concave down** bend ("frowning") is acceptable; bending upward ("smiling") is not acceptable.
2) Flip the card over and make sure the other side is also flat.
3) If the card is **concave up** ("smiling"), either the top knuckle is pressing too hard or the bottom knuckle isn't pressing hard enough, or both. Follow these steps to adjust one of them:
   a) If most of the embossed character heights are **greater than 0.0180**, decrease the pressure on the **top knuckle by subtracting 1** from the current setting (see **Figure 5-3**).
   b) If most of the embossed character heights are **less than 0.0180**, increase the pressure on the **bottom knuckle by adding 1** to the current setting (see **Figure 5-3**).
   c) Create and measure a tuning card and repeat the steps in this section until the card is flat or slightly frowning, and the embossed character thickness is between **0.0170 in.** and **0.0190 in.**
4) If the card is **concave down** ("frowning" when face up), either the top knuckle is not pressing hard enough or the bottom knuckle is pressing too hard. Follow these steps to adjust one of them:
   a) If most of the embossed character heights are **less than 0.0180**, increase the pressure on the **top knuckle by adding 1** to the current setting (see **Figure 5-3**).
   b) If most of the embossed character heights are **greater than 0.0180**, decrease the pressure on the **bottom knuckle by subtracting 1** from the current setting (see **Figure 5-3**).
   c) Create and measure a tuning card and repeat the steps in this section until the card is flat and the embossed character thickness is between **0.0170 in.** and **0.0190 in.** or until a single knuckle setting change has changed the card from slightly concave up to slightly concave down.

5.4.7 How to Fine-Tune Embossed Character Height Using Software

If the embossed character height of the last card is between **0.0180 in.** and **0.0190 in.**, the embosser is calibrated; skip this section. Otherwise, to perform fine adjustment of embosser character thickness, follow these steps:

1) Create and measure a tuning card.
2) Make sure the embossed character thickness is **between 0.0170 in. and 0.0190 in.** by following the steps in the previous sections.
3) In the ExpressCard 2000 Utility, navigate to **Menu** > **Settings** > **Edit Config** to open the **Configuration Editing** password page.
4) Use the onscreen keypad to enter password **1234567** and press the **E** key.
5) Use the onscreen keypad to enter password **7654321** and press the **E** key.
6) Scroll through the settings list to find **CamAngleTop** and **CamAngleBottom**.



7) If most of the **FontID1** embossed character thicknesses are **less than 0.0180 in.**, increase the thickness:
   a) Select **FontID1 > CamAngleTop**, add 10 to the current setting, enter the new value in the text entry box at the top right of the screen, and press the **E** key.
   b) If the latest tuning card was slightly concave down ("frowning") around FontID1, leave **FontID1 > CamAngleBottom** setting as it is. Otherwise, select **FontID1 > CamAngleBottom**, add 10 to the current setting, enter the new value in the text entry box at the top right of the screen, and press the **E** key.
8) If most of the **FontID2** embossed character thicknesses are **less than 0.0180 in.**, increase the thickness:
   a) Select **FontID2 > CamAngleTop**, add 10 to the current setting, enter the new value in the text entry box at the top right of the screen, and press the **E** key.
   b) If the latest tuning card was slightly concave down ("frowning") around FontID2, leave **FontID2 > CamAngleBottom** setting as it is. Otherwise, select **FontID2 > CamAngleBottom**, add 10 to the current setting, enter the new value in the text entry box at the top right of the screen, and press the **E** key.
9) Press the **Save** button to save the new settings.
10) Repeat the steps in this section until all embossed font thicknesses are between **0.0180in.** and **0.0190in.**

5.4.8 Aligning Embossed Characters with Printed Characters

IMPORTANT: Skip section 5.4.8 if the EC2000 you are calibrating does NOT require embosser tuning / EC1000 backward compatibility.

5.4.8.1 About Aligning Embossed and Printed Characters

When not using the foil tipping feature, the EC2000 can apply coloring to embossed characters using a two-step process:

1) First, the EC2000 prints the face(s) of the card with non-raised ink.
2) Later, the EC2000 stamps the raised or indented characters into the card at the same location where those characters have been inked.

Clearly in this type of process, it is important for both steps of the process to print and stamp the characters precisely on top of each other. Occasionally, after **periodic maintenance** or **firmware updates**, embossed and printed characters may become misaligned. Re-aligning them is called **Tuning**, and it involves adjusting both character **position** and the character **spacing**. **Figure 5-8** shows what a card may look like if the position is not properly tuned.

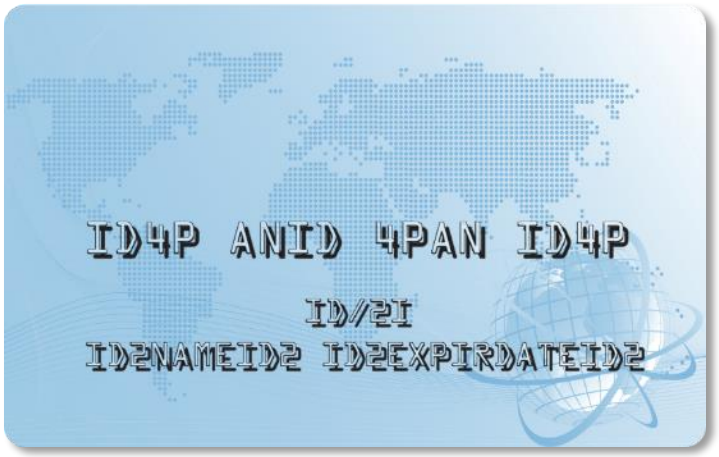


Figure 5-8 - Embosser Not Properly Tuned

Custom applications may use the fonts in different ways, but the most typical arrangement is shown in **Figure 5-9**. The list of available fonts and their typical uses is in **Table 5.1**.

Font ID1
Font ID2
Visa Electron or American Express fonts
Font ID3
AUTHORIZED SIGNATURE
NOT VALID UNLESS SIGNED
598
Font ID4
Thank you for your participation in MagTek's ExpressCard 1000 demonstration!
Please visit www.magtek.com for more information on MagTek technologies.

Figure 5-9 - Fonts and Corresponding Font IDs

Table 5.1 - Fond ID Fields

FIELD ID	DESCRIPTION
Font ID1	Generally used for the Primary Account Number (PAN), the account number on either a debit or a credit card.
Font ID2	Generally used for the cardholder name and the card expiration date.
Font ID3	Reserved for devices equipped with Visa Electron or American Express fonts.
Font ID4	The rear indent font, generally used for the CVV code on the back side of the card next to the magstripe.

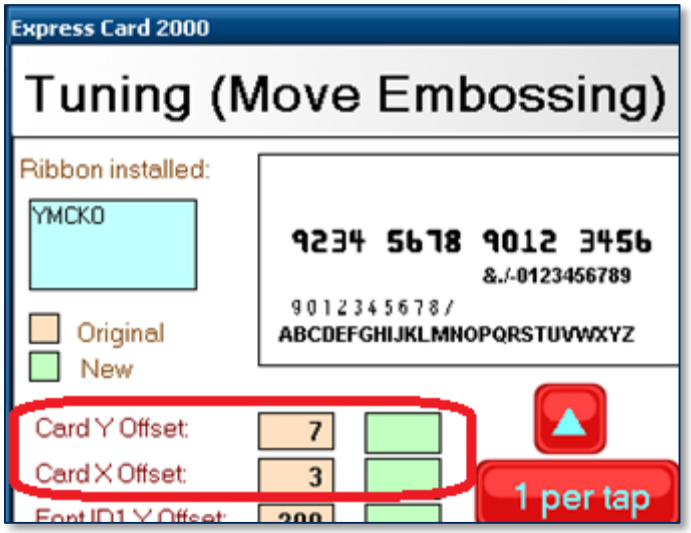
5.4.8.2 How to Align Embossed and Printed Characters

In this tuning procedure, you will need to notice subtle differences in alignment between embossed characters and the ink on top of them. The easiest way to do this is to lay the card flat at eye height so you are looking at the character from the edge of the card, and note how light or dark the character looks. Then turn the card around and note how light or dark the character looks from the other side. The lighter-looking side is the side the embossed text needs to move AWAY from. For example, if the **right** side looks **darker**, the embossed character is too far to the **left**.

To change calibration values on the EC2000 "Tuning" pages, select the **New** field next to the value you want to change, then use the up and down arrows to adjust the value. If you want the value to move in larger or smaller amounts when you press the arrows, press the **N per tap** button between the arrows.

Follow these steps to tune the embosser so embossed characters are aligned with printed characters:

1) Install the type of image printer ribbon you want to calibrate with. Embosser tuning can be ribbon-specific, so you should repeat this procedure for every type of ribbon that will be used in the device. See section **1.1 Required Tools** for a complete list of ribbons.
2) Close the top access door.
3) Navigate to **Menu** > **Settings** > **Tuning** to open the **Tuning (Move Embossing)** page.
4) Make sure the ribbon information in the upper left corner matches the ribbon you are using. If it doesn't, set and calibrate the ribbon (see the ***ExpressCard 2000 User Installation and Operation Manual*** for details).
5) Turn on the **Color** checkbox if the ribbon is YMCKO or YMCKOK.
6) Calibrate the **Card X Offset** and **Card Y Offset** settings, which changes the position of all fonts:
   a) Press the **Print** button. The EC2000 will create a test card with all font IDs.
   b) Look **only at the first character** of the long string of letters at the bottom of the card (Font ID2) from all angles, and determine whether the embossed character is to the left, right, above, or below the printed character.

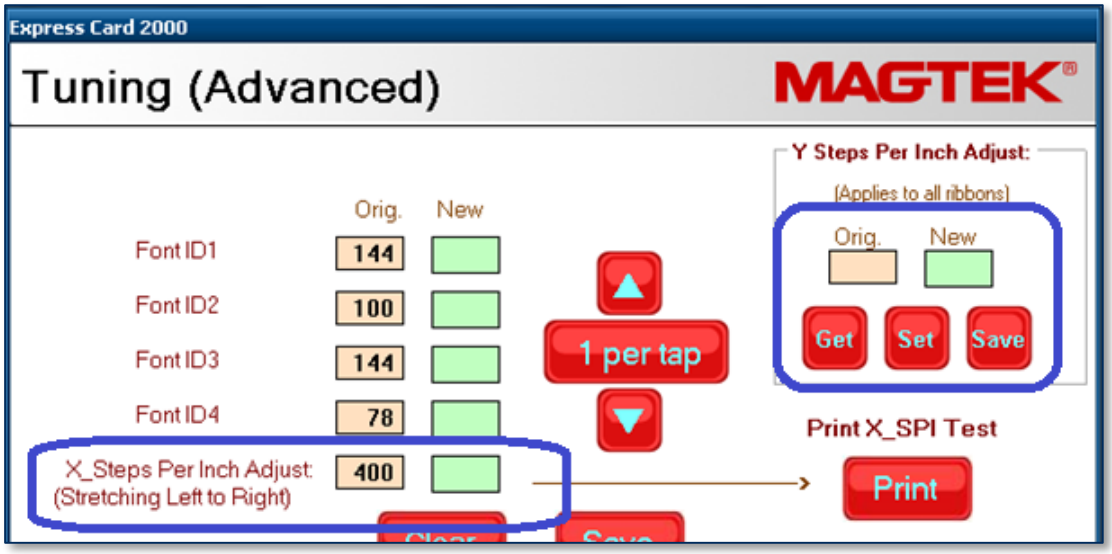


   c) If the embossed character appears to the **left** of the printed character, **increase** the **Card X Offset** setting and press the **Save** button.
   d) If the embossed character appears to the **right** of the printed character, **decrease** the **Card X Offset** setting and press the **Save** button.
   e) If the embossed character appears **higher** than the printed character, **decrease** the **Card Y Offset** setting and press the **Save** button.
   f) If the embossed character appears **lower** than the printed character, **increase** the **Card Y Offset** setting and press the **Save** button.
   g) Repeat the process until the embossed character lines up with the printed one.

<table>
<tr><td colspan="3">Look at the FIRST letter at the bottom of the card
Adjust Card X Offset, Card Y Offset

</td></tr>
<tr><td>
↑ Card X Offset
↓ Card Y Offset</td><td>
↓ Card Y Offset</td><td>
↓ Card X Offset
↓ Card Y Offset</td></tr>
<tr><td>
↑ Card X Offset</td><td>
Finished</td><td>
↓ Card X Offset</td></tr>
<tr><td>
↑ Card X Offset
↑ Card Y Offset</td><td>
↑ Card Y Offset</td><td>
↓ Card X Offset
↑ Card Y Offset</td></tr>
</table>

7) Calibrate the **X_SPI** and **Y_SPI** settings, which changes the spacing of all fonts:
   a) Press the **Print** button. The EC2000 will create a test card with all font IDs.
   b) Look **only at the last character** of the long string of letters at the bottom of the card (Font ID2) from all angles, and determine whether the embossed character is to the left, right, above, or below the printed character.
   c) Press the **Advanced...** button to open the **Tuning (Advanced)** page.



d) If the embossed character appears to the **left** of the printed character, **increase** the **X_SPI** value and press the large **Save** button.
e) If the embossed character appears to the **right** of the printed character, **decrease** the **X_SPI** value and press the large **Save** button.
f) If the embossed character appears **higher** than the printed character, **decrease** the **Y_SPI** value and press the **Set** button, then the **Save** button.
g) If the embossed character appears **lower** than the printed character, **increase** the **Y_SPI** value and press the **Set** button, then the **Save** button.
h) Press the **Back** button to return to the **Tuning (Move Embossing)** page.
i) Repeat the process until the embossed character lines up with the printed character.

Look at the LAST letter at the bottom of the card
Adjust X_SPI, Y_SPI

↑ X_SPI
↓ Y_SPI

↓ Y_SPI

↓ X_SPI
↓ Y_SPI

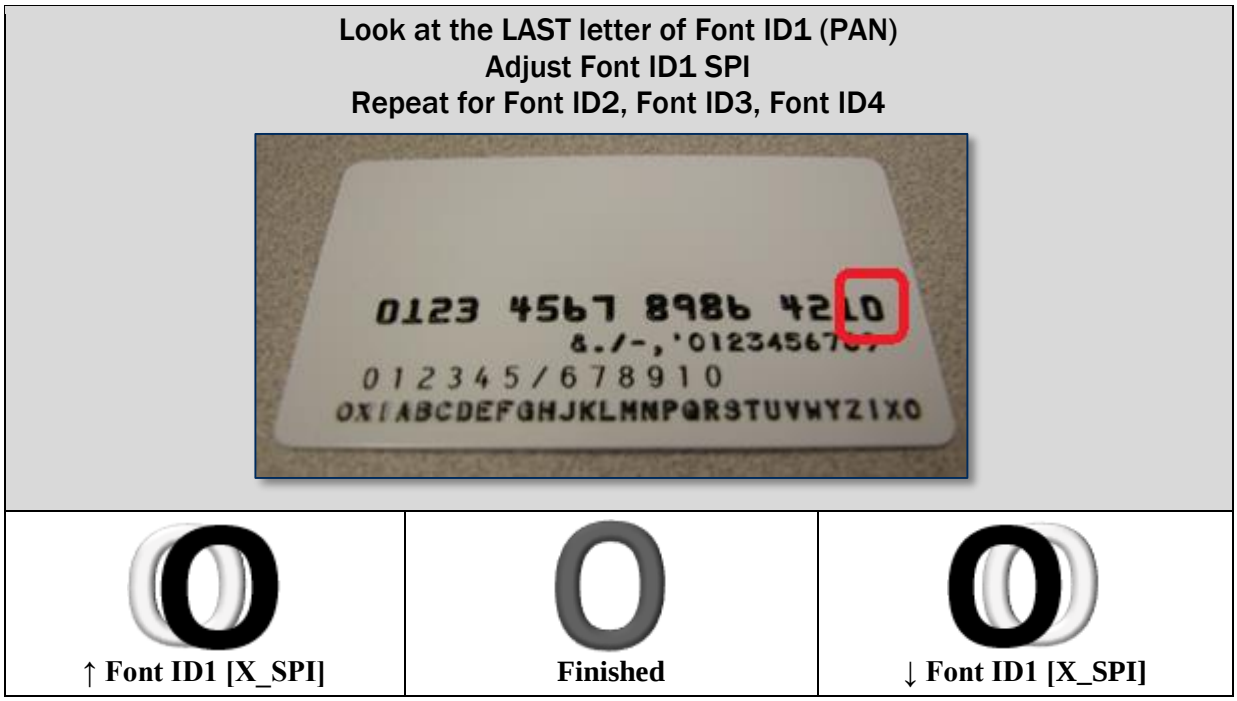
↑ X_SPI	Finished	↓ X_SPI
↑ X_SPI ↑ Y_SPI	↑ Y_SPI	↓ X_SPI ↑ Y_SPI

8) **Decrease** the **Card X Offset** setting by 1 and **Save** to allow more room to adjust the individual fonts. This provides about 10 more steps that each Font ID can move further to the left if needed.
9) Calibrate the **Font ID1 X Offset** and **Font ID1 Y Offset** settings, which changes the position of Font ID1:
   a) Press the **Print** button. The EC2000 will create a test card using every available font ID.
   b) Look **only at the first character** of the PAN (Font ID1) from all angles, and determine whether the embossed character is to the left, right, above, or below the printed character.
   c) If the embossed character appears to the **left** of the printed character, **increase** the **Font ID1 X Offset** value and press the **Save** button.
   d) If embossed character appears to the **right** of the printed character, **decrease** the **Font ID1 X Offset** value and press the **Save** button.
   e) If the embossed character appears **higher** than the printed character, **increase** the **Font ID1 Y Offset** value and press the **Save** button.
   f) If the embossed character appears **lower** than the printed character, **decrease** the **Font ID1 Y Offset** value and press the **Save** button.
   g) Repeat the process until the embossed and printed first character of Font ID1 is aligned.
10) Repeat the same process for **Font ID2**, looking **only at the first character** of the long string of letters at the bottom of the card.
11) Repeat the same process for **Font ID3** (if installed), looking **only at the first character** of the string of front-indented characters.
12) Repeat the same process for **Font ID4**, looking **only at the first character** of the string of digits on the rear of the test card. **IMPORTANT NOTE:** Because Font ID4 is on the rear of the card, adjust the **Font ID4 X Offset** in the **opposite** direction than for other fonts (where the instructions say "increase," decrease the value instead).

Look at the FIRST number of Font ID1 (PAN)
Adjust Font ID1 X Offset, Font ID1 Y Offset
Repeat for Font ID2, Font ID3, Font ID4

↑ Font ID1 X Offset ↑ Font ID1 Y Offset	↑ Font ID1Y Offset	↓ Font ID1 X Offset ↑ Font ID1 Y Offset
↑ Font ID1 X Offset	Finished	↓ Font ID1 X Offset
↑ Font ID1 X Offset ↓ Font ID1 Y Offset	↓ Font ID1 Y Offset	↓ Font ID1 X Offset ↓ Font ID1 Y Offset

13) Calibrate the **Font ID1 X SPI** and **Font ID1 Y SPI** (steps per inch) settings:
   a) Press the **Print** button. The EC2000 will create a test card with all font IDs.
   b) Look **only at the last character** of the PAN (Font ID1) from all angles, and determine whether the embossed character is to the left, right, above, or below the printed character.
   c) Press the **Advanced...** button to open the **Tuning (Advanced)** page.
   d) If the embossed character appears to the **left** of the printed character, **increase** the **Font ID1** steps per inch adjustment and press the **Save** button.
   e) If embossed character appears to the **right** of the printed character, **decrease** the **Font ID1** steps per inch adjustment and press the **Save** button.
   f) Press the **Back** button to return to the **Tuning (Move Embossing)** page.
   g) Repeat the process until the embossed and printed last character of Font ID1 is aligned.


Look at the LAST letter of Font ID1 (PAN)
Adjust Font ID1 SPI
Repeat for Font ID2, Font ID3, Font ID4
0123 4567 8986 42LO
0 1 2 3 4 5 / 6 7 8 9 1 0
OX!ABCDEFGHJKLMNPQRSTUVWYZ!XO
↑ Font ID1 [X_SPI]
Finished
↓ Font ID1 [X_SPI]

14) Repeat the same process for **Font ID2**, looking **only at the last character** of the long string of letters at the bottom of the test card.
15) Repeat the same process for **Font ID3** (if installed), looking **only at the last character** of the string of front-indented characters.
16) Repeat the same process for **Font ID4**, looking **only at the last character** of the string of digits on the rear of the test card.
17) Press the **Set Default** button to save the settings as defaults. Enter the setup passwords.
18) Write down the settings for the current ribbon on the rear of the manufacturing checklist, then repeat the process for all ribbon types that will be used in the EC2000 (YMCKO, YMCKOK, KO, etc.). After replacing the ribbon, start by setting all values on the **Tuning (Move Embossing)** and **Tuning (Advanced)** pages to the same values as the previous ribbon. Only small fine-tuning to existing values may be necessary.

5.5 How to Calibrate the Indenter Module

5.5.1 About Calibrating the Indenter Module

The rear indenter module in the EC2000's embosser moves between three positions:

- **LOAD** position: During normal operation, it is "parked" below the embosser.
- **HOME** position: During rear indent operations, it moves out of the embosser and places the ribbon between the characters on the embosser wheel.
- **UNLOAD** position: When removing the indent cartridge, it moves all the way out for easy removal.

If the indent ribbons are aligned such that indented characters are too far toward one edge of the indent ribbon, follow the steps in this section to re-align the indenter.

5.5.2 How to Calibrate the Rear Indent Cartridge Positions

To calibrate the indent position of the indenter, follow these steps:

1) Create a sample card using sample 3 in **Menu** > **Samples**.
2) Navigate to **Menu** > **Settings** > **Service** > **MCP Cmds** to open the **Controller Commands** page.

3) Under the "Indenter Move" button, select **Bot Cartridge Unload** in the dropdown list.

4) Press the **Indenter Move** button. The device will move the indenter to the unload position.

5) Look at the up-down position of the negative letters or numbers (removed ink) on the indenter ribbon. They should be centered between the top edge and bottom edge of the ribbon.

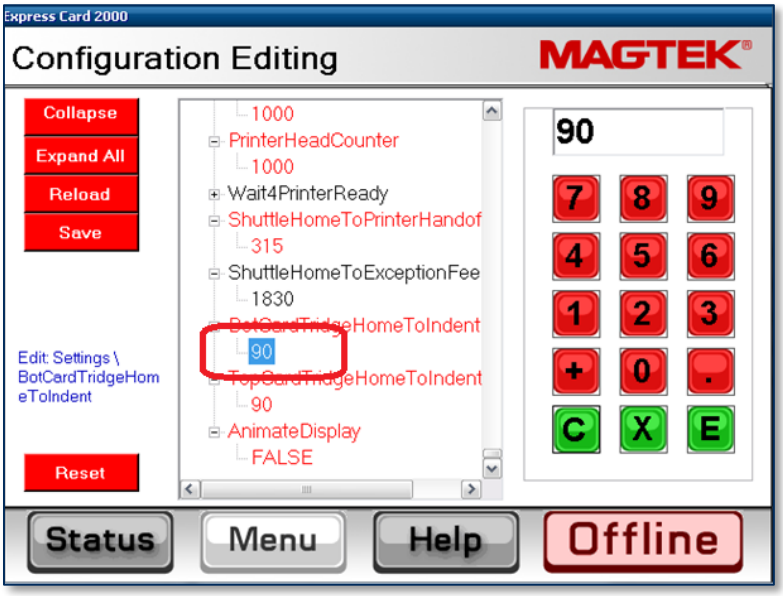
6) If they are not centered:

   a) Navigate to **Menu** > **Settings** > **Edit Config** to open the **Configuration Editing** password page.

   b) Enter password **1234567** and press the **E** button.

   c) Enter password **7654321** and press the **E** button.

   d) Scroll down in the list and select the number below the **BotCardTridgeHomeToIndent** item.



e) Press the **C** button to clear the current value.

f) If the letters were too far to the **rear** of the EC2000, enter a **larger** number for BotCardTridgeHomeToIndent. You probably only need to change by 1-5 steps.

g) If the letters were too far to the **front** of the EC2000, enter a **smaller** number for BotCardTridgeHomeToIndent. You probably only need to change by 1-5 steps.

h) Press the **E** button to finish entering the new value.

i) Press the **Save** button to save your changes. The system will report "The modified configuration has been saved." Press **OK** to close the popup window.

7) Navigate to **Menu** > **Settings** > **Service** > **MCP Cmds** to open the **Controller Commands** page.

8) Under the "Indenter Move" button, select **Bot Cartridge Load** in the dropdown list.

9) Press the **Indenter Move** button. The device will move the indenter to the load position.

10) Repeat the steps in this section until the negative letters or numbers on the rear indent cartridge are centered between the top and bottom edge.

5.5.3 How to Calibrate the Front Indent Cartridge Positions

If the device you are calibrating has a front indent ribbon cartridge (which has **white** ribbon and mounts **above** the embosser), follow the steps from section **5.5.2 How to Calibrate the Rear Indent Cartridge Positions**, with the following modifications:

- Everywhere the steps specify "Bottom" or "Bot," read as "Top."
- Everywhere the steps specify "Rear," read as "Front."

5.6 How to Calibrate the Image Printer Module

These steps may be necessary after installing a new image printer or after installing software, firmware, or driver updates.

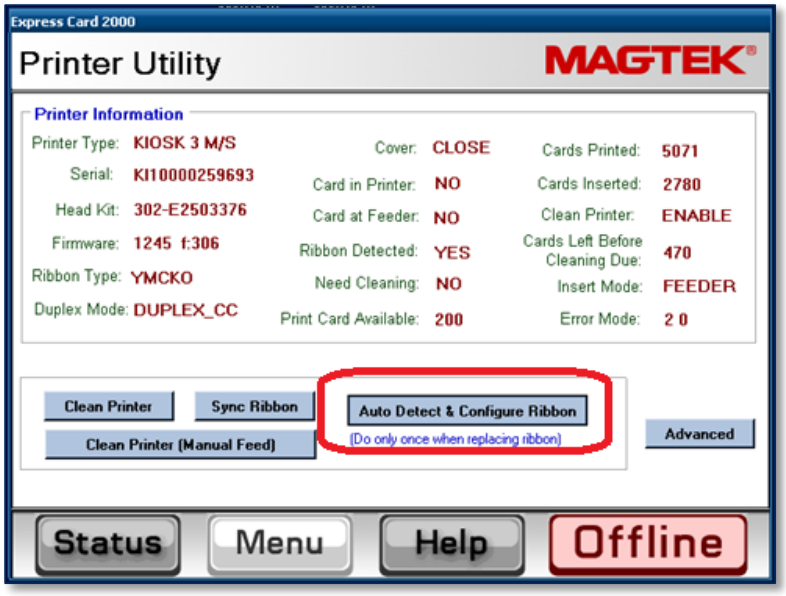
5.6.1 About Calibrating the Image Printer

The EC2000 provides options to configure the image printer. Settings include how it prints, whether it includes lamination ("Overlay") on each side of the card, the stretching and position of images, the fonts it uses to print each embossed Font ID, and so on.

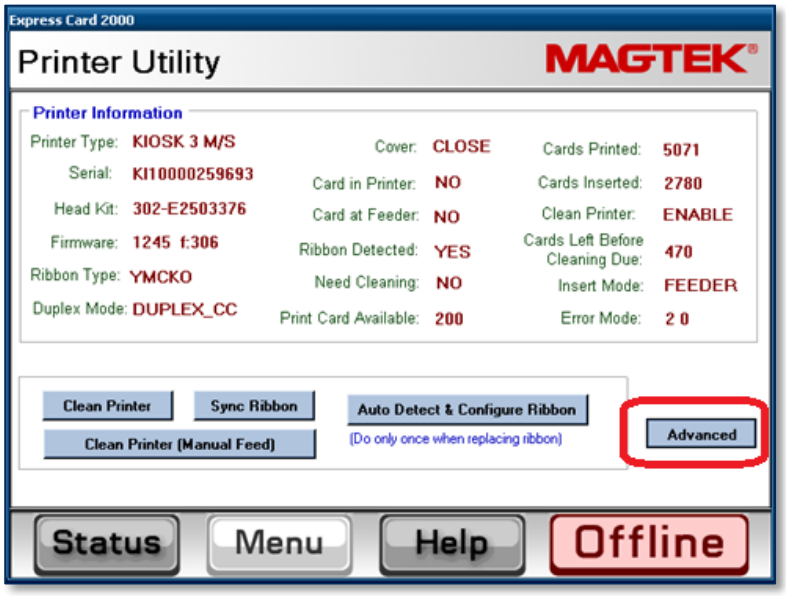
5.6.2 How to Set Ribbon, Driver Settings, Card Exit Distance

To set the image printer to factory settings, follow these steps:

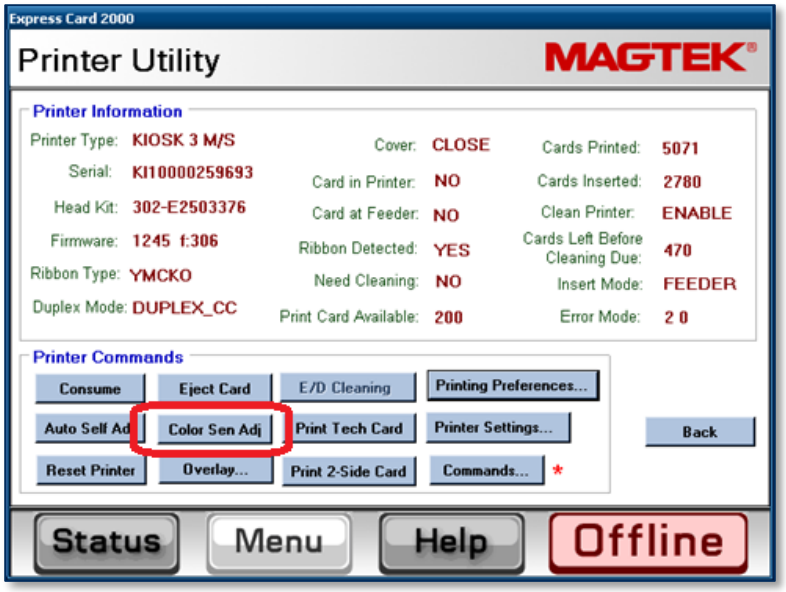
1) Install a YMCKO ribbon (see the ***ExpressCard 2000 User Installation and Operation Manual***).
2) In the ExpressCard 2000 Utility, navigate to **Menu** > **Settings** > **Printer** to open the **Printer Utility** page.
3) Press the **Auto Detect & Configure Ribbon** button. The system will show "Detecting Ribbon…" on the button until the process is complete.
4) When the system pops up a dialog box reporting "Ribbon YMCKO was successfully detected and configured," press the **OK** button.



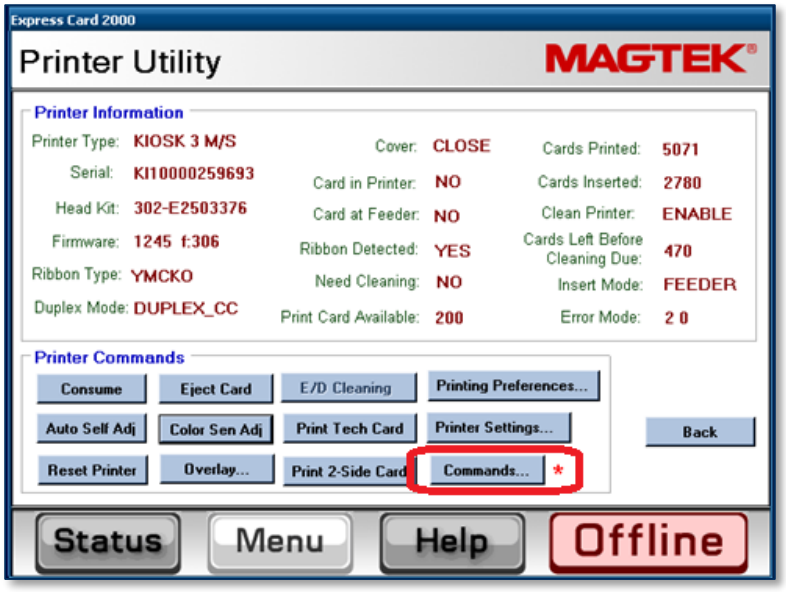
5) Press the **Advanced** button to launch the advanced **Printer Utility** page.

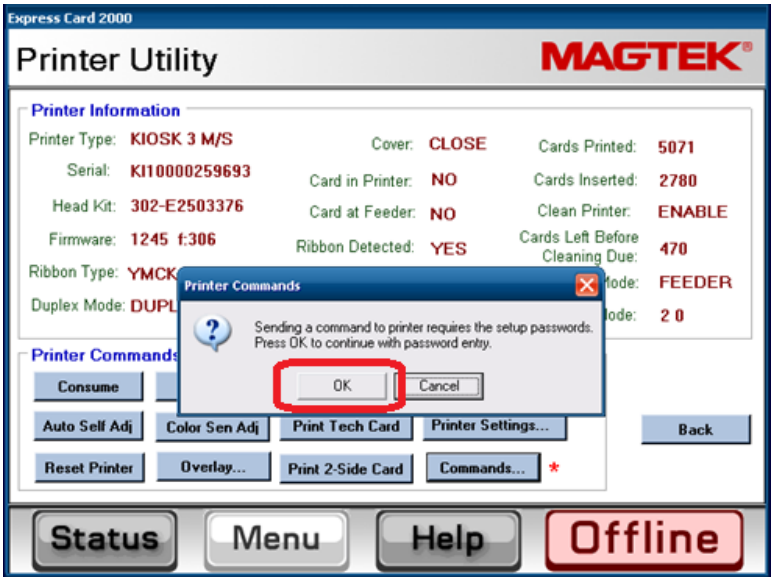


6) Press the **Color Sen Adj** button.
7) Wait about 10 seconds and listen for the printer to stop moving.

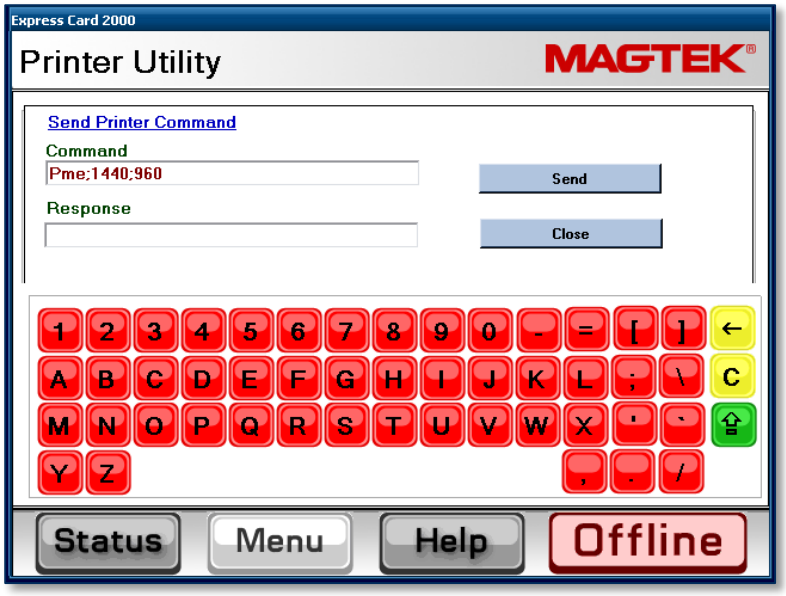


8) Press the **Commands...** button. The device will pop up a dialog box advising you that sending commands will require a password. Press the **OK** button to launch the first **Printer Commands** password page.

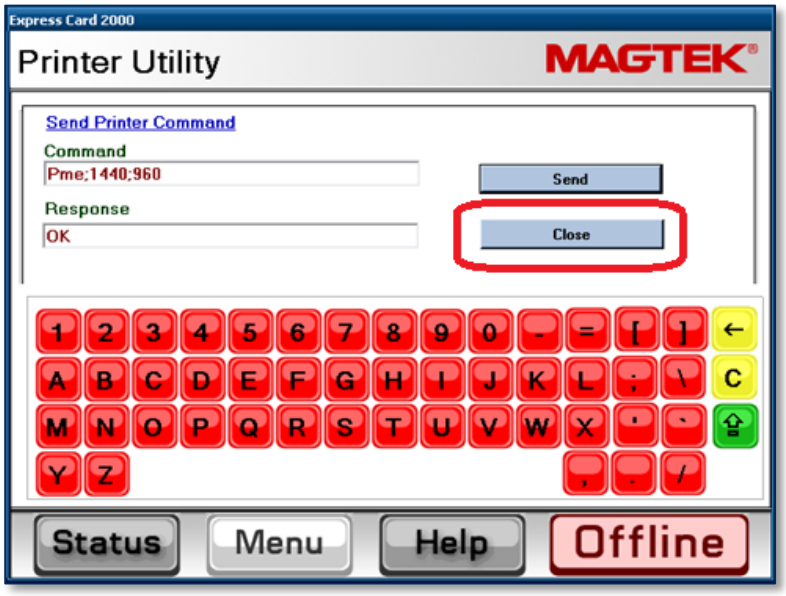




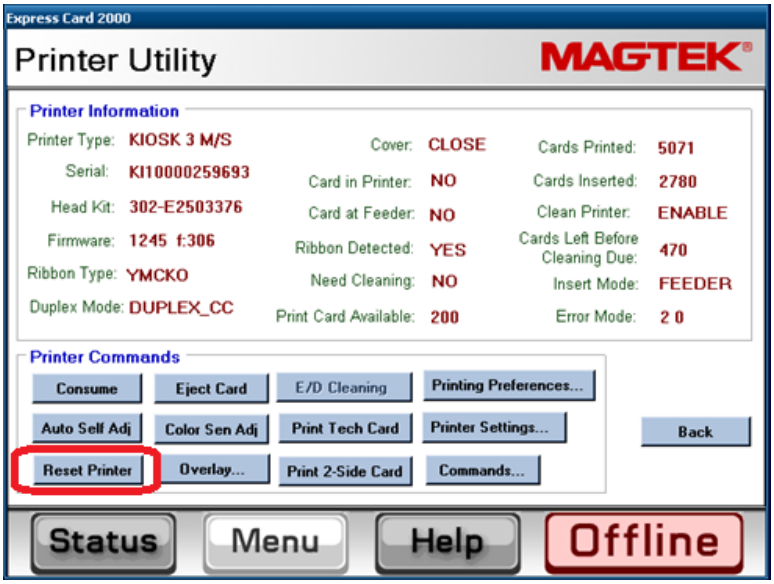
9) Use the on-screen keypad to enter password **1234567** and press the **E** key to launch the second **Printer Commands** password page.
10) Use the on-screen keypad to enter password **7654321** and press the **E** key to launch the **Printer Commands** page.
11) **Select the text box** below the word "Command" to bring up the on-screen keyboard.
12) Use the on-screen keyboard to enter the (case-sensitive!) command **Pme;1440;960** and press the **Send** button. This sets the distance cards will be pushed out of the printer on exit. The "Response" box should display "OK."



13) Press the **Close** button to return to the **Printer Utility** page.



14) Press the **Reset Printer** button and wait about 10 seconds until the printer stops making sounds.



5.6.3 How to Calibrate Image Alignment

EC2000 image printer's factory settings are calibrated to within 0.01" (1/100") of a reference image, which is finer than can be seen by the human eye. This is also the maximum resolution of the EC2000's card design XML files. Because of this, MagTek does not prescribe any additional printer alignment on the EC2000 line at this time.

5.7 How to Minimize Image Printer Margins

When issuing cards with edge-to-edge images, the width of the margins on the edges of the card is a tradeoff between two factors: Customers may desire the thinnest possible margins, but if the print head prints too close to the edge of a card, the printer ribbon may break. "Safe" margin widths depend on the ribbon type and the specific images and card stock used by the application; the image printer is pre-calibrated to minimize the margins without breaking ribbons in a majority of applications.

When possible, MagTek recommends using card layouts that are optimized for instant issuance, rather than re-using designs intended for pre-lithographed stock and trying to eliminate the margins by printing too close to the card edges and risking ribbon breakage. Recommended design techniques include:

- Including the margins as part of the design, such as fading images to the card stock color at the edges;
- Pre-lithographing border areas, including the margins;
- Pre-lithographing all areas that are not personalized. Designs of this type should account for printer variances by planning either overlaps or gaps between pre-lithographed areas and printed images.

Depending on the application, it may be possible to narrow the margins beyond the factory settings by issuing direct commands to the printer until the ribbon breaks with the application's most sensitive (break-prone) card design, then widening the margin adjustment by a few pixels.

The margin sizes are based on four values:

- The X (left-right) position of the image relative to the left edge of the card;
- The Y (up-down) position of the image relative to the top of the card;
- The X size (length) of the image, with additional rows added at the right edge of the card;
- The Y size (width) of the image, with additional rows added at the bottom edge of the card.

To minimize the image printer's unprinted margins, follow these steps:

1) Navigate to **Menu** > **Settings** > **Printer** > **Advanced** to open the **Printer Utility** page.
2) Press the **Print Tech Card** button and follow any on-screen instructions to print a card that shows the current image printer settings, which you will use later in this process. The first two values of the "X-Y-Smart Offsets" row provide the current **Rx** and **Ry** settings, and the "Printed Lines L/W" line provides the current **Rnl** and **Rnw** settings.
3) Press the **Commands...** button to open the **Printer Utility** page.
4) Select the **Command** text box. Use the on-screen keyboard and the **Send** button to send all the commands in the following steps to the image printer, and monitor the printer's responses in the **Response** text box. **Note: Commands are case-sensitive! You must use the shift key to capitalize the first letter of each command.**
5) Lower the X (left-right) position of the image on the card by following these steps:
   a) Use the **Rx** command to read the current setting for the X position.
   b) Use the **Px;=;number** command, where **number** is 1-4 steps smaller than the X value reported by **Rx**, to bring the left edge of the image closer to the left edge of the card.
   c) Create a set of test cards that represent the full range of the application's images.
   d) If test cards are created successfully, repeat the process of lowering the X position.
   e) If the ribbon breaks or the printer produces blank cards, raise the value closer to where it was to start, and re-try test cards until they are created successfully.
6) Increase the X size (length) of the image on the card by following these steps:
   a) Use the **Rnl** command to read the current setting for the X size.
   b) Use the **Pnl;=;number** command, where **number** is 1-4 steps larger than the original value reported by **Rnl**, to add rows to the right edge of the image, bringing it closer to the right edge of the card.
   c) Create a set of test cards that represent the full range of the application's images.
   d) If test cards are created successfully, repeat the process of increasing the X size.
   e) If the ribbon breaks or the printer produces blank cards, lower the value closer to where it was to start, and re-try test cards until they are created successfully.
7) Raise the Y (up-down) position of the image on the card by following these steps:
   a) Use the **Ry** command to read the current setting for the Y position.
   b) Use the **Py;=;number** command, where **number** is 1-4 steps smaller than the Y value reported by **Ry**, to bring the top edge of the image closer to the top edge of the card.
   c) Create a set of test cards that represent the full range of the application's images.
   d) If test cards are created successfully, repeat the process of raising the Y position.
   e) If the test cards show wrinkled edges or other problems, raise the value closer to where it was to start, and re-try test cards until they are created successfully.
8) Increase the Y size (height) of the image on the card by following these steps:
   a) Use the **Rnw** command to read the current setting for the Y size.
   b) Use the **Pnw;=;number** command, where **number** is 1-4 steps larger than the original value reported by **Rnl**, to add rows to the bottom edge of the image, bringing it closer to the bottom edge of the card.
   c) Create a set of test cards that represent the full range of the application's images.
   d) If test cards are created successfully, repeat the process of increasing the Y size.

e) If the test cards show wrinkled edges or other problems, lower the value closer to where it was to start, and re-try test cards until they are created successfully.

5.8 How to Calibrate the Tipper Module

These steps may be necessary after installing a new tipper module or after updating software, firmware, or drivers. Re-calibration may also be used to compensate for normal tipper platen wear.

5.8.1 Set Tipper Fan Delay to 0

The EC2000's tipper settings may show 0 for the Tipper Fan Delay value, but it the setting shown may not be accurate. Fix the value (send it to the main logic board) by doing the following:

1) Navigate to **Menu** > **Settings** > **Tipper** to open the **Tipper** page.
2) Select the **Fan Delay** value. **Even if it already says 0, select it and set it to 0 again.**
3) Press the **Save** button.

5.8.2 Align Card Position In Tipper

1) Make sure there is foil in the tipper foil cartridge (see ***99875600 ExpressCard 2000 User Installation and Operation Manual*** for detailed instructions). Be sure you have offered to give the customer any used tipper foil rolls for secure storage or disposal before using them.
2) Create a tipped sample card from **Menu** > **Samples**.
3) Remove the tipper foil cartridge for examination.
4) Examine the negative image of the card imprinted on the foil. You will see a rectangle, where the top line was created by the top of the tipper heating element, the bottom line was created by the bottom of the tipper heating element, and the text is somewhere between. The text should be **centered** up-and-down between the two lines (the lines are traced in red in **Figure 5-10**).

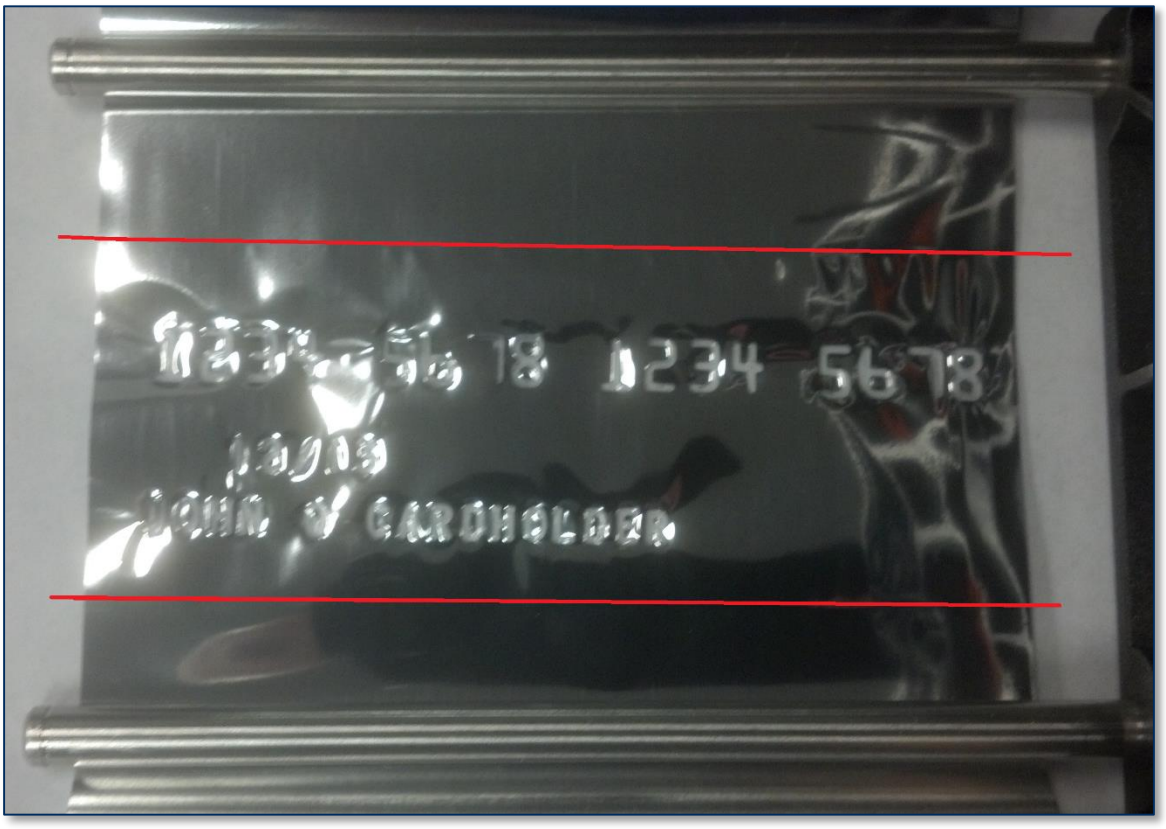


Figure 5-10 - Embossed Characters Centered In Tipper

5) If the text is not centered as shown, follow these steps to center it:
   a) Navigate to **Menu** > **Settings** > **Tipper**
   b) If the text was too high inside the rectangle, **increase** the **Grip Motor Steps** value (steps of 10 work well to start with), put the tipper foil spool assembly back in the EC2000, and repeat these steps from the beginning.
   c) If the text was too low inside the rectangle, **decrease** the **Grip Motor Steps** value (steps of 10 work well to start with), put the tipper foil spool assembly back in the EC2000, and repeat these steps from the beginning.
   d) Press the **Save** button to save settings, and press **OK** to close the confirmation popup window.

5.8.3 Calibrate Tip Angle (Pressure)

1) Create a tipped sample card from **Menu** > **Samples**.
2) Examine the card's foil-tipped characters.
3) Make sure the tipper is not "overflashing" (foil is being put on the flat portion of the card), and is not leaving embossed characters uncovered. See **Figure 5-11**. You may also be able to gauge the tipper calibration by removing and examining the foil.

Figure 5-11 - Tipper Overflashing (Left) and Inadequate Coverage (Right)

4) If the tipper is not calibrated correctly, follow these steps:
   a) Navigate to **Menu** > **Settings** > **Tipper**.
   b) If the tipper is overflashing, use the arrow buttons to **decrease** the **Tipper Motor Angle** setting (**subtract 10**). If you reduce to the minimum value of **160**, stop calibrating the Tipper Motor Angle setting and notify Engineering. Perform further adjustments by decreasing the Dwell Time setting.
   c) If the tipper is leaving embossed characters uncovered, use the arrow buttons to **increase** the **Tipper Motor Angle** setting (**add 10**). If you increase to the maximum value of **210**, stop calibrating the Tipper Motor Angle setting and notify Engineering. Perform further adjustments by increasing the Dwell Time setting.
   d) Press the **Save** button to save settings, and press **OK** to close the confirmation popup window.
   e) Repeat these steps from the beginning until the Tipper Motor Angle is properly calibrated.

5.8.4 Calibrate Dwell Time

"Dwell time" is how long the tipper holds the foil on embossed characters during the tipping cycle, and can be adjusted on the same page as Tipper Motor Angle. A typical dwell time is 100ms.

If you reached a **maximum** for the **Tipper Motor Angle** setting and the device is still not covering embossed characters completely, **increase** the **Tipper Motor Time** setting by steps of 1ms until the tipper covers properly.

If you reached a **minimum** for the **Tipper Motor Angle** setting and the device is still overflashing, **decrease** the **Tipper Motor Time** setting by steps of 1ms until the tipper covers properly.

5.8.5 Calibrate Foil Cool Time

During the tipping cycle, the hot tipper fuser presses the foil against the card, holds for a certain amount of time, then stops heating and cools down before it pulls the foil off the card. If the foil is not being allowed to cool long enough, the device may malfunction. If the foil is being left to cool for too long the device may be slow or may malfunction. A typical Foil Cool Time is 40ms. There are no specific calibration steps for adjusting the tipper cooling time.

6 Diagnosis

Follow the steps in this section to diagnose reported problems with the EC2000 and determine the appropriate solution:

1) Ask the end-user for an accurate description of the symptoms, and if possible, ask them to demonstrate live or via video. Understanding the symptoms increases your chances of fixing the problem, rather than making it worse.
2) Evaluate the device yourself and attempt to reproduce the symptoms. If the symptoms are intermittent and you are unable to reproduce them, ask the end-user to take detailed notes, to provide a video recording of the problem, or to contact you when the error occurs.
3) Go through the steps in the Troubleshooting section of ***99875600 ExpressCard 2000 User Installation and Operation Manual***
4) If the root cause of the problem is a calibration setting, adjust it according to the steps in section **5 Adjustments**.
5) If you determine the root cause of the problem is a specific part or sub-assembly, repair or replace it according to the steps in section **4 Removal and Re-installation**.

6.1 Known Symptoms and Possible Causes

This section contains additional supplemental symptoms and possible causes that are not covered in the end-user documentation, either because they would generally only appear after servicing the device, or because they can not be addressed by the user.

6.1.1 Error message "Card jam at roller station"

- Use **MCP Commands** page to test hopper transport movement and card stock feed.

6.1.2 Hopper transport does not move

- Make sure the cables below the hopper are plugged in to the right connectors in the connector panel on the top deck plate. It is possible to accidentally reverse cables that go to similar connectors.
- If the hopper transport moves but does not pull cards, check the flex cable that connects the breakout board on the top deck plate to the hopper transport. The flex cable can come loose if it is accidentally bumped during re-installation of the cover.

6.1.3 Uneven Tipping

If the foil tipping on the front of the card is uneven and can not be fixed by re-calibrating the tipper module (see section **5.8 How to Calibrate the Tipper Module**), it is possible the tipper heater needs to be replaced. See section **4.12 How to Remove / Re-install the Tipper Heater**.

Appendix A Technical Support

For technical support for the ExpressCard 2000 within the United States, contact MagTek Support Services by phone or email. If you are outside the United States, contact your local sales representative.

Phone: (651) 415-6800
Toll Free: (888) 624-8350 / (888) 415-6800
Email: support@magtek.com

Appendix B Glossary

Term	Definition
DHCP	Dynamic Host Configuration Protocol
EC2000	ExpressCard 2000
IMK	Issuer Master Key for CVC3 generation
K Panel	An area of a multicolored Ribbon (e.g., YMCK) that contains black resin for transfer to the card surface. Also used in reference to the application of preference to images printed on the card – those using the black panel in lieu of a process (YMC) black.
KMC	DES Master Key for Personalization
MCP	MagTek Control Protocol
MLB	Main Logic Board
MSR	MagnePrint Swipe Reader
PVC	Abbreviation for polyvinyl chloride, often called vinyl. PVC is a component of the 0.002" thick clear, dye receptive film on the surface of the identification card and is the primary component of the identification card cores.
Returned Cards	A card that has been issued to a card holder and returned for the purpose of testing.
SSL	Secure Sockets Layer (SSL) protocol. Originally developed by Netscape, SSL has been universally accepted on the World Wide Web for authenticated and encrypted communication between clients and servers.
USB	A 1.5M/sec (12Mbit/sec) serial communication interface that can support 127 separate devices consisting of 4 wires: power, ground, data in and data out.

Used Cards	A card that possesses all the components required for its intended purpose, which has not been subjected to any personalization or testing operations, and which has been stored in a clean environment with no more than 48 hours exposure to daylight at temperatures between 5°C and 30°C and humidity between 10% and 90% without experiencing thermal shock.
XML	Extensible markup language
XY Transport	Assembly that travels in the X-axis and Y-axis
YMCKO	The designation of colored ribbon by the panels of color in the order in which they are applied: Yellow (Y), Magenta (M), Cyan (C), Black (K) and Overlay (O).
YMCKOK	The designation of colored Ribbon by the panels of color in the order in which they are applied: Yellow (Y), Magenta (M), Cyan (C), Black (K), Overlay (O), Black (K) (used for backside, black only printing).
ZCMK	Zone Control Master Key

Appendix C Key Loading

For information about loading keys for smart cards, see ***99875603 EC2000 How to Inject Keys for Contactless Cards***.